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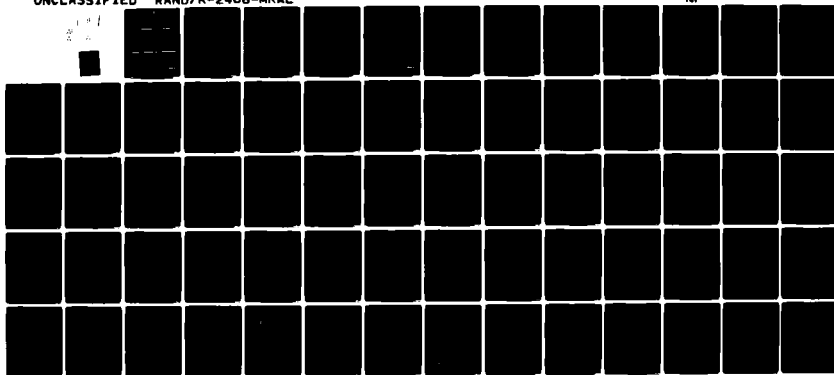
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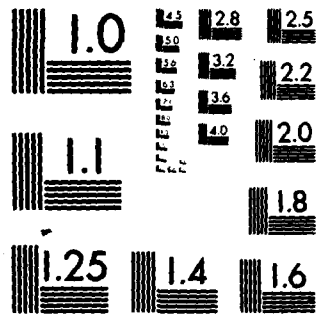


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September 1980

# Models of the First-Term Reenlistment Decision

Winston K. Chow, J. Michael Polich

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A Report prepared for

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE/  
MANPOWER, RESERVE AFFAIRS AND LOGISTICS

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The research described in this report was sponsored by the Office of the Assistant Secretary of Defense/Manpower, Reserve Affairs and Logistics under Contract MDA903-77-C-0108.

Library of Congress Cataloging in Publication Data

Chow, Winston, 1951-  
Models of the first-term reenlistment decision.

([Report] - Rand Corporation ; R-2468-MRAL)

1. United States--Armed Forces--Recruiting, enlistment, etc. 2. United States--Armed Forces--Pay, allowances, etc. I. Polich, J. Michael, joint author. II. United States. Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics) III. Title. IV. Series: Rand Corporation. Rand report ; R-2468-MRAL.  
ABJ6.R3 R-2468 [UB323] O81s [355.2'2362] 80-21913  
ISBN 0-8330-0260-0

The Rand Publications Series: The Report is the principal publication documenting and transmitting Rand's major research findings and final research results. The Rand Note reports other outputs of sponsored research for general distribution. Publications of The Rand Corporation do not necessarily reflect the opinions or policies of the sponsors of Rand research.

Published by The Rand Corporation

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM	
1. REPORT NUMBER RAND R-2468-MRAL ✓	2. GOVT ACCESSION NO. AD-A091862	3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle) Models of the First-Term Reenlistment Decision.		5. TYPE OF REPORT & PERIOD COVERED Interim rept	
6. PERFORMING ORG. REPORT NUMBER		7. AUTHOR(s) W. K. Chow, J. M. Polich Winston K. Chow J. Michael Polich	
8. CONTRACT OR GRANT NUMBER(s) MDA903-77-C-0108 ✓		9. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
10. PERFORMING ORGANIZATION NAME AND ADDRESS The Rand Corporation 1700 Main Street Santa Monica, CA 90406		11. CONTROLLING OFFICE NAME AND ADDRESS Office of the Assistant Secretary of Defense/ Manpower, Reserve Affairs & Logistics Washington, DC 20301	
12. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) 12/66		13. REPORT DATE September 1980	
14. SECURITY CLASS. (of this report) UNCLASSIFIED		15. NUMBER OF PAGES 60	
16. DISTRIBUTION STATEMENT (of this Report) Approved for Public Release: Distribution Unlimited			
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report) No Restrictions			
18. SUPPLEMENTARY NOTES			
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) <div style="display: flex; justify-content: space-between;"> <div> Military Personnel  Military Planning  Income  Compensation </div> <div> Manpower  Surveys  Reenlistment </div> </div>			
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) See Reverse Side			

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Uses survey data on about 4000 first-term Army, Navy, and Air Force enlisted personnel to construct a model of reenlistment based on survey measures of the value of regular military compensation (RMC), bonuses, in-kind and in-cash allowances, and negative aspects of the service environment. Concludes that reenlistment rates would rise significantly if RMC were increased, but that changes in the other factors would have negligible effect. Reenlistment rates were higher among personnel who received higher bonus payments, among females and nonwhites, and among those who received the dependent quarters allowance in kind instead of in cash. Rates were lower among those who underestimated the value of their compensation, who had completed high school education or more, whose test scores indicated high mental ability, and who served in the Air Force. Although rises in RMC are effective, the authors concluded that shifting to all-cash compensation would entail dislocations that could outweigh the beneficial effects on reenlistment.

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# Models of the First-Term Reenlistment Decision

Winston K. Chow, J. Michael Polich

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**OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE/  
MANPOWER, RESERVE AFFAIRS AND LOGISTICS**

**Rand**  
SANTA MONICA, CA 90406

## PREFACE

This Report was prepared as part of The Rand Corporation's Manpower, Mobilization, and Readiness Program, sponsored by the Office of the Assistant Secretary of Defense for Manpower, Reserve Affairs, and Logistics—OASD(MRA&L). The study was carried out under Task Order II-1, "Career Force Management." Manpower issues are assuming an ever greater importance in defense planning and budgeting. The Rand program is developing broad strategies and specific solutions for dealing with present and future defense manpower problems.

The data for this study derive primarily from the 1976 DoD Personnel Survey, which was designed jointly by Rand, the Third Quadrennial Review of Military Compensation, and the Defense Manpower Data Center (DMDC). DMDC and the survey organizations of the individual military services carried out the survey and provided the data to Rand for analysis. Preliminary results of the analysis have been provided to OASD(MRA&L), the Third Quadrennial Review of Military Compensation, and the 1976 Defense Manpower Commission.

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## SUMMARY

The reenlistment rate in the military services affects defense policy in manifold ways. First, it is an important consideration in decisions about compensation levels, particularly regarding bonuses awarded to increase retention. Second, assumptions about retention influence policies on fringe benefits such as housing and medical care, as well as policies that affect the "quality" of the service environment, such as rules about changes of station and transportation of dependents. Third, retention problems often lead to shortages of skilled technical and supervisory personnel, for whom the civilian market offers substantial competition. Fourth, personnel lost through failure to reenlist must be replaced by new accessions. Low reenlistment rates thereby increase the resources that the nation must devote to initial military recruitment and training.

The proper level of military compensation has been a perennial issue in the debate about reenlistment policy. One reason is the sheer complexity of the military compensation system. In addition to base pay, service members are entitled to free food (subsistence) and free housing (quarters); those who do not get such in-kind payments receive nontaxable cash allowances instead. The result is that many service members underestimate the true market value of total "regular military compensation," including all such payments, and perceive their compensation to be less than the official pay tables indicate. This situation has prompted numerous proposals to rationalize the compensation package through adoption of a salary system or similar "visible" means of payment. Other viewpoints hold that the causes of low reenlistments should be sought in the rigorous demands of military life, including frequent moves, remote locations of stations, lack of dependent travel payments, long hours of work, and so forth. Rectification of such problems could involve policy changes to reduce the frequency or severity of such burdens, or to increase compensation to the affected personnel.

This report assesses the influence of these various factors on reenlistment. By analyzing the reenlistment rates of personnel previously surveyed, we have estimated the effects of regular military compensation, bonuses, in-kind allowances, and negative aspects of the military service environment. Our model of the reenlistment decision also takes into account several important factors that are less subject to direct control by the military, including factors related to civilian employment opportunities, the influence of the draft in initial enlistment decisions, and individuals' attitudes toward military service. The report describes the importance of all of these factors in the reenlistment decision and estimates the changes in reenlistment rates that would be expected if certain changes were made in those factors that are subject to management control.

The model is based on a representative sample of approximately 4000 first-term Army, Navy, and Air Force enlisted personnel who were initially surveyed in 1976, at a time when they were within one year of the reenlistment point. They were questioned in detail about their perceived compensation level, their experiences in the service, their working conditions, their attitudes about the service, their reenlistment intentions, and the circumstances under which they first entered the

military. One year later, after they had passed the reenlistment point, their records were inspected to determine whether they had reenlisted. Although formal eligibility for reenlistment could not be assessed through our data, we were able to classify most respondents either as having reenlisted for two years or more, or as having voluntarily departed from the service. We found a very close match between the intention to reenlist, as expressed in the survey, and actual reenlistment.

The data were used to construct a multivariate logit model predicting an individual's probability of reenlistment based on the characteristics listed above. To test the stability of the model, we formulated several alternative specifications. The results show that reenlistment rates rise significantly as regular military compensation rises. Reenlistment rates were significantly higher among those who received higher bonus payments, and among females and nonwhites. Higher rates were also found among personnel receiving the dependent quarters allowance in kind (in the form of free family housing) rather than in cash, but there was no such difference between in-kind and in-cash payment of the nondependent quarters allowance or the subsistence allowance.

Reenlistment rates were significantly lower among those who underestimated the value of their compensation, those who had completed high school or had been to college when they entered the service, those whose test scores indicated high mental ability, and those who served in the Air Force. These patterns persisted when statistical controls were instituted to adjust for the degree of draft pressure at the time of initial enlistment and for unfavorable attitudes about the military, all of which had highly significant effects on reenlistment. Effects associated with the individual's experience of several negative aspects of the service environment, including separation from family, frequent rotation, and unusually long hours of work, were not highly significant in these models.

Among those factors that had significant effects, the magnitude of the effects varied widely. We assessed the magnitude of policy-relevant effects, for practical purposes, by estimating the change in the reenlistment rate that would occur if a given factor were changed by a substantial amount. Projections from the model showed that a 10 percent increase in regular military compensation would produce a 39 percent increase in the existing reenlistment rate—from 0.225 to 0.312. In contrast, a relative change of 50 percent, or even 100 percent, in the service environment factors produced negligible projected effects (changes of less than 5 percent in the reenlistment rate, raising it to 0.236 at most). The effect of policy changes in the food and quarters allowances was also minor. We estimated that a complete change from in-kind allowances to an all-cash system (including payment of the current tax advantage in cash) would change the reenlistment rate by only about 11 percent, from 0.225 to 0.249. Less drastic changes, such as measures that would raise service members' perceptions of their pay to their actual compensation level, would produce slightly smaller increments in reenlistment. These projections suggest that the considerable dislocations that would be engendered by a shift to an all-cash compensation policy might well outweigh the beneficial effects on reenlistment.

## ACKNOWLEDGMENTS

The authors are indebted to Majors Ralph Praeger and Mike Bryant, successive directors of Enlisted Personnel Management, for their support during the analysis phases of this work. The analysis also benefited substantially from the counsel of David S. C. Chu and Richard V. L. Cooper while they were at Rand. James R. Hosek and Dennis M. De Tray of Rand contributed valuable technical reviews. Bill Lisowski at Rand provided programming assistance. Credit is due to Frank Harding, formerly of DMDC, for cooperation in the design and execution of the survey. Special thanks are due to Helen Rhodes and Majorie Schubert for their typing, and to Will Harriess for editing the final draft.

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## I. INTRODUCTION

The reenlistment rate for members of the military services is an important indicator of the state of armed forces manpower. Reenlistment, broadly speaking, is a joint decision made by a member of the service and by his superiors: a commitment that the individual will continue on active duty for a substantial period of time (usually three or four years). The policies of the military services affect reenlistment rates through their "demand constraints," such as rules for eligibility and informal guidance or decisions made by supervisors and commanders. In this report, however, our primary concern is with reenlistment *supply*, that is, the propensity of eligible enlisted personnel to reenlist.

Reenlistment rates are important elements of policy analysis because of their implications for overall management of the armed forces. Levels and types of military compensation, for example, are often justified as necessary for retaining qualified personnel. Considerations about retention also affect many decisions about routine personnel management, such as frequency of moves from one station to another and the types of benefits provided to dependents of military personnel. Decisions about these issues are influenced by the assumption that a policy may depress reenlistment rates if it imposes burdensome conditions on service members. Reenlistment rates also directly affect accession rates, because new recruits must replace personnel who leave. Finally, many military occupational specialties suffer from personnel shortages that would ease if reenlistment rates in those specialties were higher. In some specialties, low reenlistment rates may be due to highly attractive civilian job opportunities open to incumbents; in other specialties, low reenlistment rates may reflect the inherently unattractive features of the work (e.g., combat arms). Although little is known at present about the importance of these factors in affecting reenlistment rates within specialties, they cause problems for the Department of Defense because the departure of technical specialists from the service creates turbulence and implies substantial losses of investments in training.

The military services and the Department of Defense have conducted many studies of reenlistment. As noted in recent reviews of the literature (Perry, 1977; Enns, 1977), those studies have usually focused on a narrow set of predictor variables. Work done within an economic framework, for example, has concentrated on estimating the effects of increased pay or bonuses on reenlistment supply (Nelson and Wilburn, 1972; Haber and Stewart, 1975; Enns, 1977). In a different tradition, many noneconomic studies have examined perceptual and attitudinal variables without specific attention to compensation rates (e.g., Lockman et al., 1972; Stoloff et al., 1972). Generally, compensation factors are viewed as "policy tools" that management can manipulate to affect reenlistments, whereas noneconomic variables are viewed as "limiting factors" that may make a particular subgroup more difficult to retain.

For a full understanding of reenlistment processes, both types of variables should be considered. It is desirable to control for noneconomic factors, such as background characteristics or attitudes toward the military service, because they

are correlated with level of compensation. A model that integrates all factors is much more likely than a less complete model to provide an accurate assessment of the responsiveness of reenlistment to changes in compensation. To our knowledge, no previous study has attempted to construct a model of reenlistment that integrates detailed measures of the economic value of military compensation with a broad range of noneconomic factors representing the experiences of enlisted personnel. This study set out to identify such variables and to construct a reenlistment model that incorporates all of them.

Existing research leaves a number of issues unresolved. For example, there is little empirical basis for determining the effects of noncash compensation in the military, although the DoD makes considerable investments in subsistence and quarters allowances, paid in kind rather than in cash to many service members. It could be argued that some recipients of in-kind benefits may value these payments at less than their nominal value, suggesting that the services may not be obtaining the maximum return from such expenditures. On a broader level, we know that many military personnel do not appreciate the value of the military compensation package because of its complex structure. That structure includes both cash pay, allowances, and a tax advantage resulting from the nontaxable status of allowances. However, we do not know precisely how reenlistment rates are affected by the extent to which personnel misperceive or underestimate the true value of their compensation.

Further, many surveys have identified service members' complaints about their environment, such as the necessity for frequent changes in location, separation from family, and long hours of work. All of the services have policies that attempt to minimize these burdens and to distribute them equitably. Yet, again, the relationship of these aspects of the military environment to reenlistment rates is uncertain, and hence policymakers have little to go on in assessing the possible benefits of policy changes.

One reason that these questions have not been answered is simple: The data are difficult, expensive, and time-consuming to accumulate. Most of the factors mentioned above can be measured only through a large-scale survey of military personnel. Most surveys have been one-shot events in which the respondent is asked to report on his or her attitudes and experiences, without any followup. In the typical study, if reenlistment is measured at all, it is measured by asking a question about the respondent's *intention* to reenlist, leaving open the possibility that intentions may be poorly related to reenlistment. In some areas of human behavior, research has shown a fairly weak relationship between intentions and behavior (Schuman and Johnson, 1976). To solve this problem, of course, a researcher must follow individuals in a *longitudinal* study and determine their behavior at the next reenlistment point. In most studies, the identifying information for carrying out the followup has been absent; and in any event, few investigators have had the time or the resources to conduct followups.

The present study was designed to overcome these problems by carrying out a *longitudinal study of military personnel* approaching the first-term reenlistment point, beginning with a rich data base of "independent variables"—factors that might affect the reenlistment decision. These factors were measured in a *baseline* sample survey of DoD personnel in 1976. The survey inquired in detail into the types of compensation actually received by respondents; their perceptions of the

value of certain compensation elements; and their attitudes toward military compensation. It also obtained respondents' perceptions of their probable civilian job opportunities.

Attitudes toward the service and intentions for reenlistment were also assessed, and respondents were asked about their personal experiences with the demands of military service, including moves to undesirable stations, frequent separation from families, and long hours of work. At our request, DoD obtained identifying numbers from the survey respondents. After their reenlistment point had passed, DoD then determined their status from personnel records. We thus were able to combine the criterion of actual reenlistment with a wide range of data on actual compensation, perceptions of the compensation package, indicators of civilian earnings opportunities, experiences in the service environment, and attitudes toward the military job. Our objective was to assemble all of this information, first into a descriptive portrait of military personnel, and second into a multivariate model that predicts reenlistment behavior.

This approach has its limitations. As in all nonexperimental research, the estimates produced by this study could be affected by variations in extraneous variables that, despite our best efforts, might remain uncontrolled. "Selection effects" can be particularly troublesome. As an example, suppose that we estimate the effects of military pay by comparing the reenlistment rates of high-pay and low-pay service members. Even if many other factors are statistically controlled, people who receive higher pay may be different from others. It could be, for example, that people who advance quickly were more productive or positive toward the service to begin with. In our models, we attempt to control for such phenomena by including variables representing individuals' abilities, attitudes ("tastes" for military service), and other factors. Some of our coefficients could still be biased, however, if selection phenomena remain incompletely represented in the model. For the purposes of policy research, there is little alternative. The only method guaranteed to eliminate such influences would be a large-scale experiment in which individuals were randomly assigned to varying pay levels. Such a method has statistical advantages, but would be exceedingly difficult to carry out. It would also be subject to problems of artificiality, intervention effects, and other distortions that can occur in experimental research. Under the circumstances, we adopted a nonexperimental approach, with the intention of cautioning the reader wherever possible methodological problems are apparent.

The results of this study can assist in policy formulation by yielding data that are relevant to a number of policy issues. An obvious area of relevance is the model's estimates of the effects of pay. Our data also illuminate the subjective value of allowances received and the importance of receiving allowances in kind instead of cash. The findings show the extent to which recipients misperceive their military pay, and in particular, the degree to which pay effectiveness is diminished by misperceptions. Our measures of aspects of the service environment help to assess the extent to which negative features of military service depress reenlistment rates. Finally, the study assesses the value of cross-sectional surveys that rely on measures of reenlistment intentions. We make this assessment by examining the reliability of survey-reported intentions as indicators of later reenlistment decisions.

Section II below describes our basic definitions and measures of reenlistment

rates. In Sec. III we define our measures of factors that affect the reenlistment decision, and show their relationships with reenlistment rates. In Sec. IV we formulate a multivariate model of the reenlistment process and present its implications for research and policy.



## II. ASSESSING REENLISTMENT

Reenlistment is defined as a voluntary decision by a member of the military services to continue on active duty for an additional length of time. It can be measured in a variety of ways. The military services and the DoD have their own data bases for recording reenlistments according to various criteria, and these data bases routinely produce estimates of reenlistment rates for policy and planning purposes. However, existing management data systems afford very limited insight into the process of reenlistment or the causal factors that influence reenlistment decisions. With management data that are readily available, it is difficult to distinguish persons who are eligible for reenlistment from those who are ineligible. The data also contain few if any measures of factors that affect reenlistment, apart from simple demographic characteristics such as sex, race, or education. Finally, the data sources do not routinely follow individuals *longitudinally*, so that their characteristics, measured at a point before reenlistment, can be related to their subsequent decisions on whether to reenlist or not.

The April 1976 DoD Personnel Survey was designed to overcome these problems. One large sample of survey respondents was designated to receive a questionnaire instrument containing a broad range of questions about factors that might influence reenlistment. This questionnaire, identified as Form A of the 1976 Survey, is reproduced in App. C. The people who received it were randomly drawn from active-duty service members, with oversampling of people who were *within one year of the reenlistment point at the time of the survey*. Appendix B presents further details on the sample design and data collection procedure.

The respondents were then traced over the ensuing year to determine whether or not they reenlisted. The Defense Manpower Data Center made tracing possible by matching survey questionnaires identified by Social Security Number against personnel records as of March 1977. These data enabled us to examine the respondents' survey-reported behaviors, attitudes, and conditions, as predictors of their later actual reenlistment decisions.

### MEASURING REENLISTMENTS

Reenlistment is a simple concept, but difficult to operationalize. Since we are interested in estimating the supply of reenlistments based on personal characteristics and policy-relevant variables, we would ideally wish to distinguish voluntary decisions to remain in the service from voluntary decisions to depart. Below, we explain how we did so and show the resulting reenlistment rates for various categories of personnel.

Because this study did not interview respondents at the one-year point, its data on reenlistment behavior are limited to measures that can be derived from the personnel files. For persons who remained in the service, such measures included an indication that the person was still in service as of March 31, 1977, and a record of his or her date of expiration of term of service (ETS) at that time. To determine

a reenlistment, we required that the ETS date indicate a substantial extension of the term of service beyond what was obligated at the time of the survey. This requirement reflected our judgment that short-term extenders are often uncertain of their intentions and may be remaining in service for only a brief period to obtain better opportunities. We therefore imposed the condition that the ETS date in March 1977 must be at least 24 months later than the ETS date in March 1976 in order to indicate a reenlistment. All individuals who met that condition and who were still in the service in March 1977 were considered reenlistees.<sup>1</sup>

For persons who did not remain in the service, we obtained Inter-Service Separation Codes from the DoD files. These codes record the official reason for the separation, such as expiration of term of service, medical discharge, etc. For this study, we designated a person as a voluntary separation only if his or her separation code indicated normal separation at the end of ETS or a clearly voluntary condition for leaving the service (such as hardship discharge). All other separations were those over which the individual had little or no control, judging by the coding classifications.

We are aware that some persons may have wished to reenlist but were not eligible or were discouraged from doing so by various constraints imposed by the services. For example, at the time of the survey all services had eligibility requirements, usually based on rank, education level, or occupational specialty, but sometimes based on factors that would be more difficult to measure, such as commander or supervisor decisions. Because we were unable to identify systematic criteria for these requirements that could be used with our data base, our measure of reenlistment includes some unmeasured "demand constraints"—that is, distortions introduced by the classification of some individuals as voluntary separations when in fact they would have reenlisted had they been eligible. Future studies should attempt to isolate such factors, if possible, by obtaining individuals' reports of their reenlistment decision process and the constraints that were imposed on it. To test for such effects, we did some analyses using the survey data from 1976 to omit people who would have been most subject to ineligibility (e.g., personnel who did not have at least the rank of E-4 and who expressed reservations about their prospects for eligibility at the time of the survey). The results did not differ significantly from those shown in this report, which use the full sample. Therefore, in our judgment, eligibility constraints probably did not affect our overall results substantially. However, it must be cautioned that within specific subgroups, such as particular occupational specialties in the Air Force where reenlistments are severely limited, our results could be seriously affected by these unmeasured effects.

To facilitate analysis of first-term reenlistment decisions, certain omissions were made from the original data file at an initial stage of analysis. To ensure consistency in analysis, we included only respondents who met all of the following five conditions:

1. Current term of service is the first term of enlistment (question 50).
2. Time remaining in current enlistment term is less than one year (question 14).

<sup>1</sup>A more complete account of reenlistment behavior should also consider the length of the reenlistment term chosen by an individual. However, detailed data on the precise reenlistment contracts accepted by the members of our sample were not available.

3. Length of service on active duty is six years or less (question 13).
4. Current status is member of the Army, Navy, or Air Force (question 1).
5. Pay grade is no higher than E-6 and consistent with pay grade expected in the future (question 43).

The first three conditions were imposed to select first-termers within one year of reenlistment. The fourth condition was imposed to exclude Marine Corps personnel from the analysis because our personnel file data for them were incomplete (missing mental test scores). The fifth condition was used to eliminate inconsistent responses relating to pay grade, which in some of our analyses was used to estimate promotion opportunities and expected military income over the succeeding three years.

After selecting the sample according to these criteria, our data base included 4600 cases. Among these, over 500 cases were excluded because they did not meet either of the two following conditions defining reenlistments and voluntary separations:

6. Reenlistments: Still in the service in March 1977, and the ETS date was 24 months or more later than the ETS date in March 1976.
7. Separations: Separated by March 1977, and the separation code indicated expiration of term of service, early release, or hardship (codes 01-08 or 22).

The sample that met all seven conditions included 4078 cases, our basic analysis group. These people could be unambiguously classified as first-termers who either reenlisted for at least two years or separated from the service voluntarily.

The reenlistment rate was defined as the quotient of reenlistees divided by the total analysis sample (reenlistees plus voluntary separations). As shown in the "total" row in Table 1, the reenlistment rate for this group was 0.225, which is fairly close to official DoD estimates of first-term rates using other data sources. In this sample, the reenlistment rate shows moderate variation across the three services, with the Air Force rate being the lowest (0.189) and the Army rate the highest (0.277). The Air Force has a more restrictive system for determining reenlistment eligibility than the other services; the interservice variations could arise partly from such demand constraints. It is widely believed among servicemen, however, that civilian employment opportunities are superior for Air Force personnel because of their training and job experience; therefore, differences in such characteristics could explain the lower reenlistment rate in this Air Force sample. The multivariate model described in Sec. IV will enable us to examine this possibility more carefully.

The basic relationship between reenlistment rates and pay grade can be seen by examining the respondents' current pay grade and expectations for future promotions, as shown in Table 2. Respondents were asked their pay grade at the time of the survey, and the pay grade they would expect to achieve in three years if they remained in the service. The "total" column of this table shows that current pay grade, as expressed at the time of the survey, was substantially correlated with reenlistment rates. There is also an apparent effect of increasing promotion opportunities after the individual's current pay grade has been taken into account. The reenlistment rates tend to be very low for those who expect only minimal promotions (no higher than E-4), and they rise as perceived promotion opportunity in-

**Table 1**  
**FIRST-TERM REENLISTMENT RATES**  
**BY SERVICE**

Service	Reenlistment Rate <sup>a</sup>	(N)
Army	.277	(1038)
Navy	.237	(1184)
Air Force	.189	(1856)
Total	.225	(4078)

<sup>a</sup>Proportion reenlisting.

**Table 2**  
**REENLISTMENT RATES BY CURRENT GRADE AND**  
**PROMOTION EXPECTATION<sup>a</sup>**

Current Pay Grade (Time of Survey)	Promotion Expectation (Pay Grade Expected in 3 Years)			Total
	E4	E5	E6 or Higher	
E3 <sup>b</sup>	0.057 (70)	0.163 (227)	0.250 (40)	0.151 (337)
E4	0.098 (163)	0.196 (2162)	0.287 (811)	0.214 (3136)
E5 <sup>c</sup>	— (0)	0.210 (76)	0.342 (529)	0.326 (605)

<sup>a</sup>Numbers in parentheses show the number of cases in each cell.

<sup>b</sup>Includes 41 cases indicated as E2 in survey.

<sup>c</sup>Includes 18 cases indicated as E6 in survey.

creases. For example, among E-4 respondents who expected to remain in that grade after three years, the reenlistment rate was just under 10 percent; but it rose to about 20 percent for those who expected a promotion to E-5 within three years and to about 29 percent for those expecting a promotion to E-6.

However, these relationships should not be immediately interpreted as indicating a causal effect of increasing pay on reenlistment. Other explanations could be offered. For example, one could argue that individuals who have more desirable traits (say, high ability or high productivity) would advance in rank more rapidly. If such traits were also recognized and rewarded in civilian life, those individuals would face better civilian opportunities for employment. Under these circumstances, the differences in reenlistment rates among pay grades might underestimate the true causal effect of a military promotion. Hence a complete model should attempt to control for ability, education, and other background characteristics that might influence civilian opportunities.

A second line of reasoning might be that rapid advancement stems partly from liking military service. According to this hypothesis, people with an initial predilection for military life would be more likely to adapt well and to rise more quickly in the service. Because of their "taste" for the military, they might also be predisposed to reenlist. In such a case, the difference in reenlistment rates among pay grades would overestimate the true causal effect of increasing pay. This suggests the need for controlling the positive or negative attitudes of the sample members in a larger model.

Several characteristics other than pay grade importantly affect the attractiveness of military service, particularly the compensation level. Table 3 shows how reenlistment rates are related to dependency status, one of the more salient of these characteristics. Individuals who are married or have other dependents receive substantial increments in allowances for quarters, and they benefit more than single people do from the free medical care provided by the services. Numerous other benefits, such as savings in purchases made in base exchanges, also yield disproportionate benefits for people with dependents. There are also other reasons why married persons may be predisposed to remain in service; conjecturally, one could cite the better housing made available to personnel with dependents who live in government housing, and the greater security of service employment compared with civilian employment, which could appeal to persons with families. It is not surprising, therefore, that Table 3 shows reenlistment rates to be higher among personnel with one or more dependents.

Table 3  
REENLISTMENT RATES BY GRADE AND  
DEPENDENCY STATUS

Current Pay Grade	Number of Dependents		
	0	1 or More	Total
E3	0.120 (226) <sup>a</sup>	0.207 (111)	0.148 (337)
E4	0.165 (1668)	0.270 (1468)	0.214 (3136)
E5	0.289 (308)	0.364 (297)	0.326 (605)
Total	0.178 (2202)	0.281 (1876)	0.225 (4078)

<sup>a</sup>The numbers in parentheses show the number of cases in each cell.

Clearly, the extent to which these correlations reflect causal relationships cannot be seen from these simple tabulations. Section III develops more refined measures of monetary pay, including cash pay, allowances in cash, and allowances in kind, as well as variables representing extra pay derived from dependency status, bonuses, and a number of other sources. We also specify the importance of other aspects of the service environment that could be partially represented here, such

as the extent of family separation, undesirable locations for families, and frequency of moves (rotation), all of which could be correlated with pay grade, dependency status, or occupational specialty. Such measures will be used in multivariate models to estimate effects more precisely than can be done with the results shown thus far.

### **ACTUAL REENLISTMENT VERSUS INTENTION TO REENLIST**

This study focuses on actual reenlistment decisions as measured by the personnel records. However, many studies of reenlistment have not been able to wait for such behavior to occur before policy conclusions had to be drawn, and the same problem will face studies in the future. Moreover, it often proves impossible to obtain identification of individual cases in a survey, making it impossible to trace the behavior of the subjects. For such reasons, researchers are often forced to rely on an individual's *intention* to reenlist as a criterion, instead of the actual outcome. How accurate are such intentions as predictors of future behavior?

A preliminary answer to this question was given by a previous Rand study of Air Force personnel (Brunner, 1971). That research found a reasonably good match between survey intentions and later behavior. The present study offers the opportunity to retest that finding, to extend it to all services, and to explore alternative methods for quantifying the probabilities attached to intentions expressed in surveys.

Table 4 matches reenlistment rates against intentions expressed in our survey, where intentions are measured by two different methods. First, respondents were asked to rate verbally their probability of reenlisting. The results indicate that a "no" accurately foreshadows a very low actual probability (0.047). Of those who gave a definite "yes," 86 percent actually reenlisted during the next year. In general, then, intentions are strong predictors of actual behavior.

Moreover, the degree of certainty with which the intention is expressed makes a considerable difference. In the 1976 DoD survey, we went beyond simple verbal categories to attempt quantification of reenlistment intentions. The lower panel of Table 4 shows nine probability categories that were given to respondents in a second question about reenlistment intent. They were asked to select which probability level best approximated their predictions, anchored by other verbal cues, such as "slight possibility (2 in 10)." Again, the results show a close match between intentions and outcomes. For example, among respondents who said that their chances of reenlisting were 0.10 or less, only 5 percent did reenlist; and among those who said their probabilities were 0.90 or greater, 89 percent reenlisted. For all levels of intention probability, the actual reenlistment rate is close enough to the intention level to be valuable for aggregate prediction. This means, among other things, that analysis may use survey-reported intentions with reasonable confidence that the intentions are valid indicators of both relative and absolute probabilities of later behavior.

All of the subjects in our analysis sample were within one year of reenlistment at the time of the survey. This fact could make a significant contribution to the accuracy of their expressed intentions. We do not have followup data for persons

Table 4  
REENLISTMENT RATES BY SURVEY REENLISTMENT INTENTION<sup>a</sup>

Reenlistment Intention <sup>c</sup>	Reenlistment Rate <sup>b</sup>				(N)
	Army	Navy	Air Force	Total	
Verbal category <sup>d</sup>					
Yes	.816	.936	.853	.862	(497)
Undecided, but probably yes	.606	.670	.597	.620	(377)
Undecided, but probably no	.271	.224	.160	.216	(519)
No	.062	.068	.028	.047	(2614)
Probability Category <sup>e</sup>					
.90-1.00	.844	.959	.876	.889	(368)
.80	.816	.914	.800	.836	(128)
.70	.517	.773	.741	.667	(78)
.60	.562	.440	.638	.567	(104)
.50	.523	.615	.600	.578	(125)
.40	.423	.333	.362	.378	(132)
.30	.436	.300	.250	.326	(187)
.20	.216	.152	.082	.140	(342)
.00-.10	.064	.073	.032	.051	(2562)

<sup>a</sup>First-term personnel within one year of reenlistment at survey.

<sup>b</sup>Actual voluntary reenlistment (versus voluntary separation) measured one year after the survey (March 1977).

<sup>c</sup>Expressed at time of survey (April 1976).

<sup>d</sup>Question 51.

<sup>e</sup>Question 57.

who reenlisted more than one year after the survey, so we cannot determine the closeness of matching between their intentions and reenlistment behavior. However, we do know the amount of time to the expiration of term of service among those who were within one year of ETS at the time of the survey, and we can use this information to explore whether the match is related to that variable. Table 5 shows that there is no systematic relationship between the matching of intentions and behavior, on the one hand, and the length of time to the reenlistment point, on the other hand. Those who were farthest from the reenlistment point at the survey were just as accurate as those who were closest in predicting their later behavior. With the data available, then, there is reason to assume that survey intentions can be used as accurate predictors of reenlistment behavior at least as long as one year before the reenlistment point. Whether the same is true for people whose reenlistment point is more distant remains an open question.

Although we do not have the data to resolve the point completely, it is likely that some of our respondents had already made their reenlistment decision at the time of the survey (for example, they might have made a reservation for a reenlistment position, or completed the administrative process resulting in a new enlistment contract). This situation is much more likely for people who were within three months of the expiration of term of service than for people with six months or more to go; yet Table 5 shows that time remaining did not affect the match between intentions and outcomes. Evidently, already having made the reenlistment decision was not a substantial influence in our sample.

**Table 5**  
**REENLISTMENT RATES BY SURVEY REENLISTMENT**  
**INTENTIONS AND TIME TO REENLISTMENT POINT**

Reenlistment Intention at Survey (Probability) <sup>b</sup>	Reenlistment Rate of Personnel for Whom Time from Survey to Reenlistment Point Was: <sup>a</sup>			
	Less than 3 Months	3 to 6 Months	6 Months to 1 Year	Total
.90-1.00	.875	.927	.866	.889
.80	.913	.838	.809	.836
.70	.667	.769	.588	.667
.60	.423	.621	.612	.567
.50	.484	.559	.635	.578
.40	.474	.250	.412	.378
.30	.359	.377	.286	.326
.20	.138	.098	.166	.140
.00-.10	.041	.041	.071	.051

<sup>a</sup>Question 14.

<sup>b</sup>Question 57.



### III. MEASURING FACTORS IN THE REENLISTMENT DECISION

This section reviews factors that could affect the decision to reenlist and measures as many of them as practicable. We concentrate on those factors that are subject to policy control by the DoD, such as military compensation and certain characteristics of the working environment. We also, however, measure characteristics of the individual or his or her environment that DoD cannot control, if they seem likely to have a strong effect on reenlistment decisions. It is important to know, for example, whether most of the variances in reenlistment rates are associated with pay differences—a factor that DoD can affect directly—or whether reenlistment is strongly affected by features of the service environment or by attitudes that service members hold about military life.

We begin by examining the various aspects of military compensation, including cash pay, allowances in cash and in kind, tax benefits, and bonuses. In addition to the actual value of compensation, we consider servicemen's *perceptions* of their compensation. Second, we consider indicators of civilian earnings opportunities as measured by individuals' background characteristics. Third, we examine several aspects of the military service environment that are often thought to depress reenlistment rates: frequency of rotation, stations outside the continental U.S., amount of separation from family, and hours of work. Finally, we include a number of measures of job-related attitudes and a general measure of draft pressure at the time of initial enlistment, which can be seen as an indicator of an individual's overall "taste" for military service.

#### VALUE OF MILITARY COMPENSATION

Except for the reenlistment bonus, the value of the military compensation package is, in general, poorly understood by enlisted personnel, even though many previous studies have shown it to be one of the major factors affecting reenlistment. Military pay is most difficult to measure, being perceived in vague, ambiguous, and different ways. Many people are unwilling or unable to provide estimates of their annual Regular Military Compensation (RMC),<sup>1</sup> or the values they place on fringe benefits. It is commonly believed that many personnel are unaware of the tax advantage of the cash Basic Allowance for Quarters (BAQ) and cash Basic Allowance for Subsistence (BAS). Those who are aware of the advantage often fail to realize exactly how much they gain from it. Therefore, if future changes in policy are contemplated in the hope of inducing more enlisted personnel to reenlist, especially among specialties that are in low supply, it is essential to fully

<sup>1</sup>RMC denotes the total of four elements: (1) *base pay* (always paid in cash, an amount depending on rank and years of service); (2) *subsistence allowance* (a nontaxable amount, forfeited if meals are taken in a military mess); (3) *quarters allowance* (a nontaxable amount depending on rank and number of dependents, forfeited if housing is provided by the military); (4) *tax advantage* (an amount depending on rank and number of dependents, representing the nontaxable status of the allowances).

understand how characteristics of pay affect reenlistment decisions.

We examine four aspects of military pay. First, we construct precise measures of the RMC that a person receives, based on pay grade, years of service, and dependency status.

Second, our measures of RMC include a method for distinguishing the effects of pay given in cash from pay given in kind. This is done by including indicator variables that denote whether the subsistence allowance was provided in kind (e.g., meals taken in mess halls) and whether bachelor quarters or family quarters were provided by the government.

Third, we construct a variable representing people's *perceptions* of the value of their RMC, as opposed to the actual value. In the 1976 DoD surveys the respondents were asked to estimate their RMC. The perceived RMC variable can therefore be included in our model, whereas other studies failed to do so because the information was not readily available to them. If the effect of the difference between the perceived and actual values of RMC turns out to be positive and statistically significant after controlling for total pay and other conceptually influential factors, this would suggest that the DoD would benefit from making the actual value of compensation more visible and better understood. This would favor the general argument for a "salary system." If, however, the coefficient associated with the difference in RMC turns out to be much smaller than the coefficient associated with total pay, extra efforts will be required in determining whether it is worthwhile to implement a salary system when the cost incurred from changing the entire military pay system is also taken into consideration. This is one of the issues we address in this report.

Fourth, we develop a measure of the reenlistment bonus available to each member of the sample. The bonus is paid to members of certain occupational specialties (generally those in short supply), with a few administrative exceptions. Our measure represents the annual value of the bonus that a given individual would receive if he or she reenlisted.

In what follows, we describe in detail how we measure the components of pay variables included in our model.

### Actual Cash Value of RMC

In principle, the actual cash value of RMC can be represented as

$$\text{RMC} = \text{BASEPAY} + (1 + \text{TXADV})(\text{BAQ} + \text{BAS})$$

where BASEPAY denotes the basic cash pay, BAQ denotes the cash Basic Allowance for Quarters, BAS denotes the cash Basic Allowance for Subsistence, and TXADV denotes the estimated tax advantage of the allowances.<sup>2</sup> RMC is calculated from the person's rank, year of service, and dependency status, as supplied in the survey using the October 1975 pay tables (i.e., the pay scale in effect when the

<sup>2</sup>In 1976, the value of BAS was calculated as \$924 per year (\$2.53 per day). Annual values of the quarters allowance and tax advantage are estimated as follows:

Pay Grade	Quarters Allowance		Tax Advantage	
	Without Dependents	With Dependents	Without Dependents	With Dependents
E3	\$ 961	\$1393	26.6%	22.0%
E4	\$1084	\$1613	26.6%	23.5%
E6	\$1231	\$1843	28.2%	23.5%

survey was completed). From a traditional economic point of view, all pay variables should be measured in terms of their present discounted values. We should therefore measure this pay variable in terms of its present discounted value over the person's entire military career, assuming that he or she reenlists. Unfortunately, the length of each individual's military career is unknown.

In the survey, some information about perceived future military pay was available from a question asking for the respondent's expected rank "three years from now," assuming that he or she remained in the service (Question 43). This made it theoretically possible to estimate the person's expected total military pay over the current year and the next three years. Such an estimate would not cover the entire income stream; in effect, it assumes that income more than three years hence is not germane to the present reenlistment decision, which is a plausible assumption for junior enlisted personnel. We carried out such calculations and found that the annual present discounted value of the four years' worth of income (calculated at a nominal rate of 10 percent) was quite close to the simple current year's income. Moreover, the coefficients in our multivariate model were virtually the same, whether we used current income or the more complex average discounted income. For simplicity, we have therefore used current income as the measure of actual RMC.

Strictly speaking, our measure of actual RMC denotes the annual cash income each individual should theoretically receive based on rank, years of service, and dependency status. The cash value of RMC is shown in Table 6; however, most service members do not actually receive this amount in cash under the current pay system. For example, many single first-termers live in barracks and eat in military mess halls, and therefore are not given cash allowances for quarters and subsistence. Similarly, married personnel who are provided with military housing quarters do not receive a cash allowance for quarters. Nevertheless, since the services have made such cash provisions and, under a salary system, probably this same amount would be paid in cash to each individual for these two components of the military pay, we assume that the cash allowances represent the actual income for the individual regardless of whether the allowances are received in kind or in cash.

We are well aware that the value of in-kind allowances may not be accurately represented by the corresponding cash allowances. From the point of view of the individual, it might be preferable to receive a given amount in dollars than to receive food or quarters costing the government the same amount. This would be true, for example, if the individual would prefer to purchase different commodities (such as different types of food). In addition, the cash allowance for subsistence or quarters may not accurately reflect the cost of providing the in-kind benefits. Many observers believe that the cost of family housing provided to personnel with dependents is considerably greater than the cash quarters allowance that would be payable if government quarters were not available. These considerations suggest that in-kind compensation may not be as effective as cash compensation. To capture any possible differences in reenlistment rates engendered by in-kind payments, our model includes three indicator variables, abbreviated as BAS (designating an individual who was receiving subsistence allowance in kind), SINGLEQTR (designating an individual who had no dependents and was receiving the quarters allowance in kind), and FAMILYQTR (designating an individual who had dependents and was receiving quarters allowance in kind).

Table 6  
VALUE OF ACTUAL REGULAR MILITARY COMPENSATION<sup>a</sup>  
(In dollars)

Years of Service on Active Duty	No Dependents			One or More Dependents		
	E3	E4	E5	E3	E4	E5
Under 2 years	7404 (47)	7762 (104)	8192 (5)	7844 (11)	8352 (35)	8845 (3)
Over 2 years	7682 (76)	8054 (390)	8674 (48)	8122 (43)	8644 (239)	9327 (36)
Over 3 years	7894 (98)	8374 (1109)	8959 (205)	8334 (44)	8964 (1122)	9612 (157)
Over 4 years	8110 (4)	8842 (65)	9229 (50)	8550 (11)	9424 (72)	9882 (101)

NOTE: Numbers in parentheses show the number of cases in each cell.

<sup>a</sup> Amount computed from October 1975 pay tables based on the individual's pay grade as of April 1976, his/her dependency status, and years of service.

A very interesting and important aspect of the data in Table 6 is that those who had dependents were paid about as much as those without dependents *but* were one pay grade higher. For example, an E-4 with dependents who has served three to four years receives \$8,964, whereas an E-5 without dependents who has served for the same period of time receives \$8,959. Thus, having one or more dependents is just as valuable as receiving a promotion.

### Perceived Cash Value of RMC

The perceived value of regular military compensation (PRMC) is calculated from the response provided to a direct question<sup>3</sup> asking the respondent to estimate his or her RMC value.<sup>4</sup> Because allowances for subsistence and/or quarters may be provided in kind, RMC may not be perceived in full; in particular, many junior enlisted personnel tend to underestimate the tax advantage. Various degrees of underestimation are clearly seen in our data. Table 7 shows the median value of PRMC and the mean ratio PRMC/RMC based on the responses provided by the first-termers who are included in our data file and tabulated by pay grades, by dependency status, and by type of quarters allowance received. The number of

<sup>3</sup>Question 62: What is your annual Regular Military Compensation (RMC)? Base your answer on the total value of your basic pay, the cash value of your quarters and subsistence allowance (whether received in cash or in kind) and the federal tax advantage of the two allowances.

<sup>4</sup>We judged amounts under \$3,000 or over \$20,000 to be questionable, and treated them as invalid in order to reduce biases in estimation due to erroneous or unrealistic responses. Only 62 percent of the respondents provided valid responses, according to this criterion. Obviously, this is a high proportion of invalid data, and suggests that future military surveys should develop more appropriate questioning techniques. However, our analysis of missing data as discussed in Sec. IV found that the coefficients in the multivariate models did not vary significantly when we used more complex techniques designed to cope with missing data.

Table 7  
PERCEIVED VALUE OF RMC, AND RATIO OF  
PERCEIVED TO ACTUAL RMC

Pay Grade	No Dependents; Quarters Allowance Received:		One or More Dependents; Quarters Allowance Received:	
	In Cash	In Kind	In Cash	In Kind
<i>Perceived Value of RMC (Median, in dollars)<sup>a</sup></i>				
E3	6520 (11) <sup>b</sup>	5400 (111)	6342 (50)	4798 (8)
E4	7026 (176)	6000 (865)	7408 (812)	7500 (143)
E5	8094 (46)	6600 (152)	8145 (181)	8764 (38)
<i>Ratio of Perceived to Actual RMC<sup>c</sup></i>				
E3	0.832 [.113]	0.744 [.227]	0.755 [.153]	0.619 [.088]
E4	0.830 [.146]	0.742 [.154]	0.820 [.155]	0.811 [.154]
E5	0.881 [.113]	0.768 [.142]	0.842 [.155]	0.898 [.238]

<sup>a</sup>Median amounts computed from survey Question 62, where only responses within the range of \$3,000 to \$20,000 are considered valid.

<sup>b</sup>Number of valid responses in each cell.

<sup>c</sup>Ratio of perceived RMC (reported in survey Question 62) to actual RMC (computed as shown in Table 6), determined for each individual case. Unbracketed cell entries are the mean ratio for cases in that cell; the bracketed entry is the standard deviation of the ratio. Number of cases in each cell equals that shown in upper half of table.

valid responses for PRMC in each subgroup is also given in Table 7, together with standard deviations of the ratios. It is apparent, on the average, that actual RMC is undervalued. An overall 77.7 percent of the actual RMC is perceived in the Army, 79.0 percent in the Navy, and 80.0 percent in the Air Force.

Several reasons may be advanced to explain this widespread underestimation. First, there is the complexity of the pay system, including in-kind payments and, especially, an "invisible" tax advantage. Second, because most income surveys find that people in general underreport their income, this finding among military personnel is not surprising. (Higher-ranking personnel, however, tend to provide more accurate compensation estimates, a tendency that is seen more clearly when all ranks, including officers, are compared.) Third, some people might be estimating their take-home pay (amount received after deductions) instead of their total compensation, although the total was requested in the survey instruction. These possibilities suggest that some, but not all, of the discrepancy between actual and perceived compensation is due to the complexity of the military pay system.

Table 7 shows an important interaction affecting perception of military com-

pensation. Among people who do not have dependents, there is a definite tendency for those who receive quarters allowance in cash to perceive substantially higher pay than those who receive the allowance in kind. In many environments, unmarried junior enlisted personnel do not have the choice of in-cash or in-kind quarters; instead, they may be required to live in bachelor quarters or barracks. They may place a lower valuation on in-kind quarters partly because of the low utility of these quarters (i.e., they believe they could obtain better quarters if they were paid in cash).

In contrast, more senior personnel with dependents apparently place greater value on quarters provided by the government. In particular, married personnel with the rank of E-5 tended to value their compensation more highly if they received in-kind quarters than if they received cash. The reason could be that, in many localities, on-base housing for married personnel is better than off-base housing that one could purchase with the cash quarters allowance. There are other possibilities, however. Some respondents might be basing their estimates of in-kind value on error-prone comparisons, such as "how much this would cost me back home." Or, receiving a cash quarters allowance might be tied to other activities that some people dislike, such as housekeeping; for those with dependents, other people may perform these activities, but the single person must shoulder the burden alone.

One of the issues that this study addresses is the possible effect on reenlistment of converting the military pay system to a "salary system." In this regard, the measure to be studied is therefore not PRMC per se, but rather the difference between the perceived and actual values of RMC, which, from here on, will be denoted by DIFFRMC.<sup>5</sup> To illustrate the nature of the discrepancy, we tabulate reenlistment rates according to level of DIFFRMC in Table 8, grouped into steps of \$1000 with two open-ended intervals. Personnel are also classified into two groups according to their dependency status.

Reenlistment rates are higher for people with positive values of DIFFRMC, that is, those who perceive their pay as exceeding the fair cash values of RMC. Such people tend to have higher pay grades and to have served on active duty longer, which is consistent with the results in Table 7. Among people with zero or negative perceptual discrepancies (i.e., those who see RMC as less than its nominal value), there is little variation in reenlistment rates. Over this range of variation of DIFFRMC, then, the amount of the discrepancy appears to make little difference

<sup>5</sup>Because food and/or housing may be received in kind, and tax advantage is not immediately visible, it is often asserted that on average, service members underestimate the true value of RMC. In theory, we could consider linear effects:

$$\text{Probability of reenlistment} = a_0 + a_1(\text{actual RMC}).$$

But if a person acts according to his or her perceived value of pay, the true model may be

$$\text{Probability of reenlistment} = b_0 + b_1(\text{perceived RMC}).$$

Since

$$\text{Perceived RMC} = \text{actual RMC} + (\text{perceived RMC} - \text{actual RMC}),$$

a useful model for assessing the effect of perceptual errors is

$$\text{Probability of reenlistment} = c_0 + c_1(\text{actual RMC}) + c_2(\text{perceived RMC} - \text{actual RMC}),$$

where we expect  $c_1 = c_2$  (although if the marginal utility of income is declining, we would expect that the estimated values would be  $c_1 > c_2$ ). We prefer this formulation to merely using perceived RMC, since actual and perceived RMC are affected by different policies. In particular,  $c_2$  helps to measure the reenlistment effect of switching to a salary system.

Table 8  
REENLISTMENT RATES BY DIFFERENCE BETWEEN  
PERCEIVED AND ACTUAL RMC

Difference Between Perceived and Actual RMC <sup>b</sup>	Reenlistment Rate <sup>a</sup>		
	All Respondents	Without Dependents	With Dependents
-\$3000 or less	0.192 (480)	0.107 (261)	0.292 (219)
-\$2999 to -\$2000	0.211 (700)	0.186 (510)	0.279 (190)
-\$1999 to -\$1000	0.219 (644)	0.168 (291)	0.261 (353)
-\$999 to \$0	0.239 (587)	0.188 (213)	0.267 (374)
+\$1 or more	0.308 (182)	0.291 (86)	0.323 (96)

<sup>a</sup>Based on number of cases given in parentheses.

<sup>b</sup>Negative values indicate that perceived RMC is less than actual RMC.

in reenlistment rates. It is also notable that personnel with dependents have uniformly higher reenlistment rates than those without dependents, regardless of discrepancies between perceived and actual RMC.

In principle, we could measure yet another component of the military pay variables, the monetized value of all fringe benefits, from the survey (Question 63). Unfortunately, because of the high proportion of missing, invalid, and inconsistent responses for that question, this variable has proven to be unreliable. As an alternative, an indicator variable, DEP, is included in the model to designate that the individual has dependents. We assume that the effect of fringe benefits on all prospective reenlistees depends only on whether they have dependents, and that such an effect will therefore be captured by DEP.

### Reenlistment Bonus

Over the past decade, the military services have used reenlistment bonuses of various sizes (including zero) as an important management tool to raise or lower the number of first-term reenlistments in selected military occupations. Unlike RMC, bonuses are highly visible, being disbursed either in lump sums or in equal annual installments, and are offered only to selected occupations, which may differ from year to year. Besides stimulating reenlistments in occupations where shortages occur or are projected to occur, reenlistment bonuses encourage specialists to remain in the service, thus capturing a larger return on prior investments in human capital, especially in skills with high first-term training costs.

From January 1966 to June 1974, the variable reenlistment bonus (VRB) program provided for four bonus multiples. Each multiple was worth one month's basic pay times the number of years in the reenlistment contract, up to a maximum of \$8,000. The VRB program also included regular reenlistment bonuses (RRB) that were paid to reenlistees in all skills, thus creating an initial bonus award level to a maximum of \$2,000.

Beginning in FY 1975 the selective reenlistment bonus (SRB) replaced the VRB,

introducing some additional flexibility into the system. The switch-over included provisions for the eventual elimination of RRB, which had previously been paid to all reenlistees. This change increased the number of available bonus award levels from four to six, based the bonus computation on additional obliged service only, and increased the maximum amount to \$12,000 (\$15,000 for nuclear-trained personnel in the Navy).

Under the SRB legislation, the RRBs were not eliminated instantaneously but will be phased out under the "save-pay" provision. According to this provision, personnel who enlisted prior to June 1, 1974, are still eligible for RRBs in all skills. We can represent the annual value of the bonus as follows. BONUS equals:

- One month basic pay  $\times$  SRB multiplier, if eligible for SRB;
- One month basic pay if enlisted prior to June 1, 1974 but not eligible for SRB;
- 0 if enlisted after June 1, 1974 and not eligible for SRB.

This amount is paid for each year of the reenlistment term; thus the total reenlistment bonus for each potential reenlistee is equal to BONUS times the number of years of additional obliged service.<sup>6</sup>

Our variable BONUS differs from some other definitions of a "reenlistment bonus" since the term of the reenlistment contract is not taken into account. A reenlistee may sign up for a second term ranging between two to six years. Even though the term of reenlistment is available in our file for those who reenlisted, it is obviously not available for nonreenlistees. For the sake of studying the effect of the bonus on reenlistment decisions, our definition of BONUS will represent the potential of the bonus per year. The number of years of reenlistment is immaterial. Some other studies have assumed that for those who did not reenlist, the average reenlistment term would have been four years if they had reenlisted, and that the bonus would have been received in four equal annual installments. Our definition of BONUS is equivalent to such assumptions; it represents the amount a reenlistee would receive each year. This is compatible with other pay variables in the sense that all figures are expressed in annual figures.

Table 9 tabulates the average amount of BONUS, along with the number of potential reenlistees, categorized by pay grade and by bonus level (SRB award level, save pay, or no bonus). A higher proportion of E-5's than of lower-rank personnel is eligible for the SRB bonus awards, presumably because higher-ranking personnel have skills highly valued in the service.

The results show a small positive association between bonus level and reenlistment rate. They also illustrate an important methodological point that should be borne in mind in evaluating our results on bonuses: *The actual causal effect of awarding a bonus may well be greater than the differences among bonus levels.* The

<sup>6</sup>We used the respondent's primary military occupational specialty, as specified in the survey, to determine his eligibility for an SRB award. In principle, the first three digits of the MOS for the Army and the first two letters of the rating for the Navy provide sufficient data to determine eligibility. However, the first five digits of the AFSC, which we do not have, are required for the Air Force. Fortunately, even though only the first three digits of the AFSC were given in the survey, we also know, from the DoD personnel file, the Primary Occupational Code (DPOC) for each individual. By means of the DoD Officer and Enlisted Occupational Conversion Tables (March 1974 and December 1977), we obtained an almost perfect identification and match between the 3-digit AFSC and DPOC which enabled us to determine SRB eligibility for Air Force personnel.



Table 9  
PERCENT REENLISTING BY BONUS LEVELS

Bonus Level	SRB Bonus Offered	Pay Grade	Value of Bonus <sup>a</sup> (\$)	Number of Potential Reenlistees	Percentage Reenlisting
0	No	E3	0	42	26.2
		E4	0	105	21.9
		E5	0	2	50.0
1	No (but RRB Bonus paid under provision of "save pay") <sup>b</sup>	E3	453	224	13.0
		E4	482	2617	20.6
		E5	519	333	32.4
2	Yes	E3	869	37	13.5
		E4	948	283	25.4
		E5	1026	116	37.9
3	Yes	E3	1345	27	11.1
		E4	1438	102	27.5
		E5	1559	113	23.0
4-6 <sup>c</sup>	Yes	E3	2092	7	28.6
		E4	2206	29	34.5
		E5	2304	41	43.9

<sup>a</sup> Average annual reenlistment bonus, depending on pay grade, years of service, and bonus level.

<sup>b</sup> According to the "save pay" provision, personnel who enlisted prior to June 1, 1974, are still eligible for RRBs in all skills.

<sup>c</sup> Because of the small numbers of potential reenlistees in MOS's authorized for the highest bonus levels, they are combined into one category. Only two individuals are qualified for the SRB award level 6. Notice that the amount stated may be an overestimate, since a maximum bonus of \$12,000 (\$15,000 for Navy skill, with nuclear-trained personnel) for the additional obliged service has been imposed.

correlation between bonus level and reenlistment rate is actually a composite of several effects, including the awarding of a bonus, the civilian opportunities for members in the occupational specialties receiving the bonus, and other aspects of the occupation. To see this, one need only consider how an occupational specialty is given a bonus in the first place. Sometimes the reenlistment rate of a specialty is depressed because the specialists (e.g., electronics technicians) possess skills that are readily marketable and highly paid in the civilian sector. In other cases, the occupation may be inherently unpleasant, or people working in it may be in such short supply that they are subject to frequent moves to undesirable locations. These other aspects of the occupation, which initially led to the establishment of the bonus, are still operating when the bonus is awarded. Therefore, the differences among specialties with varying levels of bonuses are due not only to the bonus level, but also to the counteracting influences of civilian opportunities, the nature of the job, etc. In these circumstances, we may well expect that the correlation between the bonus level and the reenlistment rate *understates* the true effect of the bonus. As we will see in Sec. IV, a multivariate model that controls for the nonbonus factors will help to sort this out, but even then it is probable that the bonus coefficient remains underestimated.

## INDICATORS OF CIVILIAN EARNINGS OPPORTUNITY

Our reenlistment decision model assumes that each potential reenlistee can estimate his expected military earnings over the second term based on his current pay. In addition, the value of his potential civilian earnings over the same time period will also influence his probability of reenlistment. However, it is difficult to measure precisely the determinants of alternative civilian earnings, and prospective reenlistees can probably predict second-term military pay more accurately than civilian pay.

To capture the effect of civilian opportunities on reenlistment, the model should include variable(s) that measure alternative civilian earnings. Question 40, which asked for the civilian salary that the respondent expected to receive if he or she left the service and took a civilian job at the time of the survey, is probably the most direct approach in understanding the civilian earnings opportunities that each individual perceived. This earnings measure could reflect many related variables that pertained to each individual but were not measured. Moreover, this perceived value might be a significant factor in guiding the reenlistment decision. Unfortunately, we found that these responses on the survey failed to accomplish this task in many respects, as is discussed in detail in App. A. In what follows, we propose to use alternative measures for potential civilian earnings opportunity.

One approach might be to estimate the expected civilian pay and unemployment rates for people in this sample from their demographic characteristics, such as education, sex, etc. As discussed in App. A, we attempted such a technique using available Current Population Survey data to estimate civilian opportunities, but the results were not as informative. Accordingly, we chose to use all available personal background characteristics directly in our model to control as much as possible for individual differences in civilian earnings potential. In the multivariate analysis to be discussed in Sec. IV, these variables<sup>7</sup> include the following:

- Education, measured by dummy variables for high school graduation and some college training
- Mental ability, represented by the logit of the individual's score on the Armed Forces Qualifying Test (AFQT) administered at entry to the service
- Sex
- Race, measured as white or nonwhite
- Occupational specialty, measured by a dummy variable for electronics specialists versus others<sup>8</sup>

These variables do not exhaust the myriad factors that could affect civilian opportunities. In particular, they probably do not represent the individual's work history, skills, or productivity. The omission of such variables from the model could bias several of the coefficients we plan to estimate, especially the military pay

<sup>7</sup>Age was also measured but was found insignificant, and was therefore excluded from the model.

<sup>8</sup>Dummy variables for major groupings of occupational specialties, including combat arms, general repair/service, clerical, aviation/communication, craftsmen, medical, and electronics, were originally included in the model. However, all but the dummy for electronics showed no effect on reenlistment. Hence, all occupational specialties except the electronics group are pooled into one group called "others."

variables. These possible biases will be noted when we discuss the results of the multivariate analysis.

## SERVICE ENVIRONMENT

In addition to examining the effects of economic factors on reenlistment, this study also set out to isolate important noneconomic variables that could affect reenlistment rates or set limits to the effect of pay changes on reenlistment. We attempted to measure directly those facets of the service environment that could affect reenlistment behavior, rather than relying on respondents' attitudes or opinions about problems with their environment. Table 10 shows four aspects of the service environment that observers frequently mention in discussing reenlistment problems. Each respondent was asked directly whether or not he or she had personal experience with the particular aspect. For example, each person was asked whether he or she was currently stationed outside the U.S., how long he or she had been separated from the family during this term of service, and so forth. In our judgment, these factors are among the most prominent characteristics of military life that might set limits to the supply of military personnel or that might determine groups that can be retained only through greater compensation payments.

Table 10  
REENLISTMENT RATES BY ASPECTS OF SERVICE ENVIRONMENT

Aspect of Service Environment	Personal Experience with This Aspect	Reenlistment Rate				(N) <sup>a</sup>
		Army	Navy	Air Force	All Services	
Permanent duty station outside continental U.S.	Yes	.267	.271	.203	.245	(869)
	No	.287	.235	.186	.220	(3209)
Separation from family <sup>b</sup> for those with dependents	Yes	.312	.290	.343	.312	(557)
	No	.432	.310	.211	.268	(3521)
Long hours of work <sup>c</sup>	Yes	.273	.220	.209	.234	(1498)
	No	.281	.261	.183	.220	(2580)
Specialty with rotation imbalance <sup>d</sup>	Yes	.212	.193	.163	.180	(400)
	No	.280	.245	.192	.230	(3678)

<sup>a</sup>Number in parentheses shows the number of cases for all services.

<sup>b</sup>Among those with dependents, over 25 percent of the time since initial enlistment was spent separated from family because of service assignments (Question 34).

<sup>c</sup>Average workweek in past year 48 hours or longer (Question 17).

<sup>d</sup>Specialty with disproportionately high number of non-CONUS space (billets). Derived directly from the distribution of spaces in each military specialty, according to data supplied by the service, March 1977.

Lower reenlistment rates are found among first-termers who worked in specialties with rotation imbalance (ROTATION). This effect is especially pronounced in the Army. Rotation imbalance is defined by the individual's MOS. It is often asserted that certain occupations are predisposed to having ill effects from the frequent rotation of specialists among different location assignments. To test that assertion,

we classified tours as either CONUS (those within the continental United States and Hawaii) or non-CONUS (those elsewhere—Alaska, overseas, and afloat). Those occupations that have a disproportionate number of non-CONUS billets, and therefore assign most of the occupation's population out of CONUS at any given time, were designated as "rotation imbalanced." In addition, non-CONUS tours for such specialists tend to be longer than average; they typically have unfavorable working or living conditions in non-CONUS locations; they tend to be understrength; and they tend to require highly qualified personnel.<sup>9</sup>

Those who were stationed outside CONUS (NONUS; Question 5), those who have dependents and were separated from their families for over 25 percent of the time due to service assignments (FAMSEP; Question 34), and those who worked long workweeks (HRS48; Question 16) turn out to have lower reenlistment rates for Army and Navy personnel, with the exception of the Navy personnel who were stationed outside CONUS. Surprisingly, higher reenlistment rates are found among the Air Force personnel who experienced all these aspects of service working environment. Hence, these effects are inconsistent across services. To investigate whether these aspects of the service environment truly influence reenlistment decisions, we need to control for other factors that also affect reenlistment. We do so by using a multivariate model. The results can be found in the next section.

The evidence for the effects of the variables in Table 10 is therefore somewhat mixed. Rotation imbalance in a specialty has a moderate correlation with reenlistment rates, whereas the correlations involving the other aspects of the service environment are either trivial or highly ambiguous. To investigate these factors more thoroughly, we will include them all in our model of reenlistment presented in Sec. IV. The model also includes a set of attribute variables indicating the service to which the individual belongs.

The survey also contained several items measuring the respondent's personal experience with moves between stations. Subjects were asked for the number of permanent changes of station that they had made while in the service and how many they considered "undesirable." However, analysis showed that these items interacted in a way that made it difficult to disentangle the actual role of frequent moves from the influence of individual "tastes." Even though occurrence of undesirable moves had a significant negative effect on the reenlistment rate when other factors were not controlled, no effect was found when basic attitudes toward the military were considered in the model. Among personnel who reported no objection to any of their moves, more frequent moving was associated with higher reenlistment rates. The effects of frequent moves on reenlistment thus seem to be intimately connected with one's personal views of the places and circumstances of the moving, and with general tastes for military life. Proper interpretation of the individual moves variables would require considerably more information about the particular circumstances and evaluations of the moves made by the personnel involved. Because the presence or absence of these moves variables did not affect any of the other coefficients in the model, we omitted them from our model to reduce its complexity. The policy-relevant aspects of moving, however, are assessed in our model by the variable representing frequency of rotation.

<sup>9</sup>For a more detailed discussion, see Roberta Smith (1979).

## ATTITUDES TOWARD MILITARY SERVICE

Many discussions of reenlistment have focused on general attitudes toward military service as determinants of the reenlistment decision. Our preference has been to concentrate on specific aspects of the service job (pay, environment) that might be subject to policy change, and on alternative civilian employment opportunity, which might affect reenlistment and would be directly related to military compensation levels. However, we have also identified several measures that represent the individual's overall attitudes toward military life. Although these attitudes do not represent features of military service that DoD could realistically expect to alter directly, they could place limits on the effects of other policy variables. And, in the extreme, it is theoretically possible that a person's attitudes determined reenlistment behavior, and not his or her experiences, compensation level, or civilian opportunities.

One characteristic that could easily affect people's reenlistment probabilities is the degree of voluntarism under which they enlisted in the first place—whether or not they were subject to "draft pressure" at their initial enlistment. Many economic studies of reenlistment have treated draft pressure as a fundamental variable representing "taste" for military service; that is, in such a view, a person who enlisted only because of draft pressure (or who was actually drafted) could be expected to have some degree of distaste for military service, whereas most "true volunteers" would be more amenable to the military. Obviously, if tastes were constant over time, such factors could affect reenlistment behavior substantially. A question about the degree of draft pressure at the time of initial enlistment was included in the 1976 DoD survey (Question 76). Of course, if the data were collected among today's first-termers, this factor would not be applicable. However, since the survey was taken in April 1976, service members who enlisted before 1973 had been subject to the draft. Table 11 shows that enlistees who claimed that they definitely or probably would not have enlisted if there were no draft are less likely to reenlist, which is expected. This also happens, although to a lesser extent, among those who were not sure how they would have decided had there been no draft. Hence, an indicator variable is included in the model for controlling the draft pressure effect.

Many more direct attitudinal measures were also included in this survey; Question 19 spans a spectrum of various types of attitudes from the purely economic to such noneconomic concerns as personal freedom. In our model of reenlistment we include only some of the noneconomic attitudes. The group of economic attitudes were found to be highly correlated with the military pay and the expected civilian earnings opportunities variables. These variables overlap both conceptually and empirically with the direct economic measures that have been discussed above; moreover, we believe that our direct measures are more precise. We assume that the three noneconomic attitudinal variables we have chosen will capture additional aspects of "taste" for military life other than those represented by the draft-pressure measure. Many previous economic studies have ignored this set of variables and assumed that military pay is the driving force of reenlistment decisions, which may be unrealistic. Controlling for these "taste" variables should in theory produce more accurate estimates of the pay variables.

The three attitudinal variables we have chosen correspond to agreement with the statements that "Doing the job the military does is both necessary and impor-

Table 11  
REENLISTMENT RATE BY DRAFT PRESSURE

Draft Status <sup>a</sup>	Percentage Distribution	Reenlistment Rate
Definitely would not have enlisted if no draft	12.6%	0.083
Probably would not have enlisted if no draft	9.9%	0.163
Not sure whether would have enlisted if no draft	8.3%	0.205
Would have enlisted even without draft	38.3%	0.265
No draft at enlistment time	25.1%	0.238
Female	5.7%	0.319

<sup>a</sup>Determined by response to Question 76.

tant," "Service rules and regulations interfere too much with my right to live my life in my own way," and "In the service I cannot affect my own rate of promotion the way I could in civilian life." Table 12 shows reenlistment rates and sample sizes in each response category for these three attitudinal statements. The results are consistent with the prior belief that those who are favorably disposed to the military tend to reenlist at a higher rate. It should be noted that the three attitudinal variables eventually included in the model are created in such a way that larger values correspond to pro-military responses with the statements.

Table 12  
REENLISTMENT RATE BY ATTITUDES TOWARD MILITARY SERVICE

Attitudinal Statement	Agreement with Statement	N <sup>a</sup>	Reenlistment Rate
Doing the job the Military does is both necessary and important	Strongly Agree	946	0.329
	Agree	1812	0.243
	Neutral	774	0.138
	Disagree	314	0.092
	Strongly Disagree	123	0.065
Service rules and regulations interfere too much with my right to live my life in my own way	Strongly Agree	1577	0.131
	Agree	1074	0.195
	Neutral	750	0.333
	Disagree	474	0.433
	Strongly Disagree	109	0.284
In the Service I cannot affect my own rate of promotion the way I could in civilian life	Strongly Agree	1070	0.150
	Agree	1107	0.188
	Neutral	913	0.231
	Disagree	712	0.347
	Strongly Disagree	181	0.414

<sup>a</sup>Less than three percent of missing entries are found in each statement.

#### IV. A MODEL OF THE REENLISTMENT DECISION

The results shown in previous sections provide a descriptive analysis of the variables that were measured in the 1976 DoD Personnel Survey as potential factors in the reenlistment decision. As we have seen, many of the variables that are often thought to exercise important influence on reenlistment had very modest correlations with actual reenlistment rates among first-term personnel. These simple correlations, however, do not provide an overall model of the reenlistment decision; in particular, they do not allow us to trace the relative importance of the various factors or to estimate the changes in reenlistment rates that would occur if the policy-relevant variables were changed. The purpose of this section is to construct an overall statistical model for predicting the decision to reenlist or to separate from the service, based on the characteristics outlined in Sec. III. Alternative models for predicting reenlistment decisions are discussed in App. A, together with a model for predicting reenlistment intention.

##### ESTIMATING PARAMETERS OF THE REENLISTMENT MODEL

The conceptual framework discussed in the last section leads us to formulate a statistical model in which one can best predict reenlistment rates, constrained to lie between zero and one, based on the set of characteristics discussed in Sec. III. If  $Y_i$  takes on the value of 1 or 0 according as the  $i^{\text{th}}$  individual in the sample reenlists or not, the model of interest is one that relates this dichotomous dependent variable to the given vector of characteristics  $x_i$  by the logistic functional form:

$$Y_i = p(x_i) + \epsilon_i,$$

$$\text{where } p(x_i) = P[Y_i = 1 | x_i] = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \dots + \beta_k x_{ik})}},$$

$k$  denotes the number of characteristics measured for each individual, and  $\beta_0, \beta_1, \dots, \beta_k$  are the parameters of the model to be estimated. This is usually referred to as the conditional logistic regression (logit) model.

Two estimation methods are available for determining the values of the  $\beta$ 's. Many statisticians use the conditional maximum likelihood estimators of the  $\beta$ 's for this model. For several reasons, however, we have chosen to estimate these parameters by an alternative method known as the discriminant function technique. The principal reason for this choice is the need to take missing data into account. In addition, discriminant function estimates are much cheaper to obtain, and it has been shown empirically in many studies that the two sets of estimates are generally very close. Our concern with missing data arises from the fact that approximately 38 percent of our observations contain at least one missing entry among the independent variables of interest; a majority of these missing entries occur for the perceived RMC variable. When the data are complete, several authors have given arguments for choosing either one of these two estimators for a logistic model based

on empirical evidence (Efron, 1975; Haggstrom, 1974; Halperin et al., 1971; Press and Wilson, 1978). The comparison becomes more complex when one or more values of the independent variables of certain observations are missing. As a matter of fact, very little is known in this situation. Recently, Chow (1979) has reviewed six methods for estimating the parameters of logistic models in the presence of missing data. The methodology adopted in this report is the one suggested in that paper. As a sensitivity check, we have applied all six methods to estimate the parameters of our model; the results were essentially the same for all the methods that include observations with missing entries.

Table 13 shows the detailed definitions of the variables that are included in the model.

The regression results for three sets of explanatory variables are shown in Table 14. The first set includes only the military pay, background indicators of civilian earnings opportunities, and service attributes. Working environment variables are then added to form the second set. Draft pressure and three attitudinal "taste" variables are also included to form the third set. This sequence of model buildups allows us to study the changes in the estimated coefficients when we take into account additional variables that are less subject to policy control.

When only the military pay variables, indicators of civilian earnings opportunity, and service attributes are included in the model (Model I), the effects of RMC, the difference between perceived and actual RMC, the indicator variable designating those who had dependents and were living in military housing, reenlistment bonus, female, and nonwhite are positive and statistically significant at the one-percent level; those who were better educated, had higher mental ability, and served either in the Air Force or in the Navy show significantly negative association with reenlistment decision. Moreover, the signs of these coefficients are consistent with expectations.

The significant coefficient of DIFFRMC (the difference between perceived and actual compensation) confirms the general belief that individuals who perceive larger values of RMC are more likely to reenlist. On the average, the first-termers in our sample estimated their RMC to be approximately 22 percent below the actual value, calculated under the assumption that allowances and tax advantages were paid in cash. That finding suggests that reenlistment rates would rise somewhat if all military compensation were correctly perceived. However, since the coefficient of DIFFRMC is less than one-sixth the size of that of RMC, the benefits of attracting additional reenlistees through more accurate perceptions (e.g., by means of a salary system) may not be substantial. In particular, the modest size of the coefficient raises the possibility that the benefits may not be large enough to offset the cost of changing the entire military pay system.

A significantly higher tendency to reenlist is found among those who had dependents and were living in military housing quarters than is found among others. Among single servicemen who did not have dependents, however, no significant difference in reenlistment is shown between those who received the allowance for quarters in cash and those who received it in kind. Similarly, regardless of how the allowance for subsistence is received, no significant difference in reenlistment is observed. The estimated coefficient of the indicator variable designating having dependents is not significant even at the 10 percent level. One of the factors that this variable was hypothesized to capture is the effect of difference in fringe bene-



Table 13

## DEFINITIONS OF REGRESSION VARIABLES

Variable Name	Variable Definition
REEN	Indicator variable designating whether the individual had reenlisted.
RMC	The cash value of regular military compensation according to October 1975 pay tables.
DIFFRMC	Difference between the value of perceived and actual cash regular military compensation.
BAS	Indicator variable designating whether the individual was receiving the subsistence allowance in kind.
SINGLEQTR	Indicator variable designating whether the individual had no dependents and was receiving the quarters allowance in kind.
FAMILYQTR	Indicator variable designating whether the individual had dependents and was receiving the quarters allowance in kind.
DEP	Indicator variable designating whether the individual had dependents.
BONUS	The potential annual reenlistment bonus paid to each individual upon reenlistment.
HSGRAD	Indicator variable for personnel who were high school graduates.
COLL	Indicator variable for personnel with some college training.
AFQTLGT	Logit transformation of AFQT score.
FEMALE	Indicator variable for females.
NONWHITE	Indicator variable for nonwhites.
ELECTRON	Indicator variable for electronic equipment repairmen.
AF	Indicator variable for Air Force personnel.
NAVY	Indicator variable for Navy personnel.
NONUS	Indicator variable designating whether the individual was stationed outside the United States at the time of survey.
FAMSEP	Indicator variable designating whether an individual who had dependents was separated from his or her family due to military assignment more than 25 percent of the time since entering the service.
HOURS	Indicator variable designating whether the individual had worked, on the average, over 48 hours a week for the past year.
ROTATION	Indicator variable designating whether the individual was working in military specialties having rotation imbalance (a disproportionate number of overseas tours).
DRAFT	Indicator variable designating that the individual definitely or probably would not have enlisted without draft pressure.
MILITJOB	Agreement with the statement "Doing the job the Military does is both necessary and important": Strongly agree = 2, Agree = 1, Neutral = 0, Disagree = -1, Strongly disagree = -2.
RULES	Disagreement with the statement "Service rules and regulations interfere too much with my right to live my life in my own way": Strongly disagree = 2, Disagree = 1, Neutral = 0, Agree = -1, Strongly Agree = -2.
PROMOTION	Disagreement with the statement "In the Service I cannot affect my own rate of promotion the way I could in civilian life": Strongly disagree = 2, Disagree = 1, Neutral = 0, Agree = -1, Strongly agree = -2.

Table 14  
COEFFICIENTS OF THE REENLISTMENT DECISION MODEL

Variable	Variable Description	Coefficients and t-values		
		Model I	Model II	Model III
Constant		-6.6074	-6.6666	-5.9303
RMC x 10 <sup>-3</sup>	Actual RMC	0.6789 ( 5.77) <sup>a</sup>	0.6752 ( 5.72) <sup>a</sup>	0.5951 ( 4.78) <sup>a</sup>
DIFFRMC x 10 <sup>-3</sup>	Difference, perceived minus actual RMC	0.1052 ( 3.64) <sup>a</sup>	0.1069 ( 3.68) <sup>a</sup>	0.0913 ( 3.01) <sup>a</sup>
BAS	In-kind subsistence allowance	-0.0652 (-0.68)	-0.0934 (-0.95)	-0.0893 (-0.87)
SINGLEQTR	In-kind quarters allowance, no dependents	0.0479 ( 0.30)	0.0646 ( 0.40)	0.0788 ( 0.47)
FAMILYQTR	In-kind quarters allowance, with dependents	0.4607 ( 2.83) <sup>a</sup>	0.4635 ( 2.85) <sup>a</sup>	0.4585 ( 2.70) <sup>a</sup>
DEP	One or more dependents	0.1898 ( 1.14)	0.1797 ( 1.04)	0.1660 ( 0.92)
BONUS x 10 <sup>-3</sup>	Reenlistment bonus	0.3374 ( 2.91) <sup>a</sup>	0.3719 ( 3.13) <sup>a</sup>	0.3673 ( 2.97) <sup>a</sup>
HSGRAD	High school graduate	-0.2960 (-2.26) <sup>b</sup>	-0.3087 (-2.35) <sup>b</sup>	-0.2876 (-2.10) <sup>b</sup>
COLL	Some college training	-0.5656 (-4.00) <sup>a</sup>	-0.5838 (-4.11) <sup>a</sup>	-0.5186 (-3.48) <sup>a</sup>
AFQTLGT	Logit transform of AFQT score	-0.1842 (-4.49) <sup>a</sup>	-0.1776 (-4.31) <sup>a</sup>	-0.1577 (-3.67) <sup>a</sup>
FEMALE	Female	0.7425 ( 4.57) <sup>a</sup>	0.7334 ( 4.49) <sup>a</sup>	0.4114 ( 2.39) <sup>b</sup>
NONWHITE	Nonwhite	0.6358 ( 5.98) <sup>a</sup>	0.6375 ( 5.98) <sup>a</sup>	0.6023 ( 5.41) <sup>a</sup>
ELECTRON	Electronic repair specialty	-0.2193 (-1.77) <sup>c</sup>	-0.2104 (-1.69) <sup>c</sup>	-0.1795 (-1.39)
AF	Air Force member	-0.5842 (-5.37) <sup>a</sup>	-0.5124 (-4.46) <sup>a</sup>	-0.4166 (-3.46) <sup>a</sup>
NAVY	Navy member	-0.2953 (-2.61) <sup>a</sup>	-0.2095 (-1.72) <sup>c</sup>	-0.1401 (-1.10)
NONUS	Stationed outside U.S.		0.1866 ( 1.78) <sup>c</sup>	0.1848 ( 1.70) <sup>c</sup>
FAMSEP	Separated from family 25 percent of time		0.0973 ( 0.73)	0.1619 ( 1.16)
HOURS	Long hours of work (48 or more per week)		-0.0026 (-0.03)	0.1141 ( 1.24)
ROTATION	Rotation-imbalanced specialty		-0.2107 (-1.54)	-0.2446 (-1.71) <sup>c</sup>
DRAFT <sup>d</sup>	Draft pressure			-0.5815 (-5.51) <sup>a</sup>
MILITJOB <sup>e</sup>	Military job importance attitude			0.2847 ( 6.61) <sup>a</sup>
RULES <sup>e</sup>	Attitude toward rules and regulations			0.3854 ( 9.87) <sup>a</sup>
PROMOTION <sup>e</sup>	Promotion opportunity attitude			0.1957 ( 5.41) <sup>a</sup>

<sup>a</sup>Significant at 1%.<sup>b</sup>Significant at 5%.<sup>c</sup>Significant at 10%.<sup>d</sup>Would not have enlisted without draft pressure.<sup>e</sup>5-point scale; scored with pro-military responses highest.

fits on the reenlistment decision between those with and without dependents. This hypothesis would be consistent with the general belief that the fringe benefit package is worth more to people with dependents and hence increases their reenlistment rate. Nonetheless, the statistically nonsignificant coefficient of dependency status implies that the fringe benefit package may not strongly affect reenlistment for first-termers.

There are no surprises with the influences of educational attainment, mental ability, sex, and race on decisions to reenlist. These background characteristics appear to measure the potential of getting desirable civilian jobs. The more a person can earn in the civilian sector, the less likely is reenlistment; and if the person belongs to a group that is known to have difficulty in obtaining civilian employment, the person is more likely to reenlist. An alternative approach to measuring civilian earnings opportunities, as mentioned before, is to derive civilian opportunities variables from the Current Population Survey data by sex, race, education, etc. Readers interested in seeing how these variables, in lieu of background characteristics, affect reenlistment can find such results in App. A.

The coefficient of the indicator variable for electronic equipment repairmen is significant only at the percent level when the background characteristics were controlled. That result can be explained as follows. Being highly trained, electronic repairmen are generally better educated and more intelligent as measured by the AFQT scores. Hence, even though they are known to have lower reenlistment rates, once the background characteristics are taken into account, we found only a minor increase in reenlistment rate for this group of first-termers. The argument that their experience in electronics should improve their opportunities for landing desirable civilian jobs may therefore be relevant only in the short run. It appears that their background characteristics, such as educational attainment, are the dominant factors in determining their civilian-market success in the long run.

Many factors may have induced lower reenlistment rates among Air Force and Navy personnel. For example, Air Force personnel are generally more highly educated. Since educational attainment is expected to relate to civilian earnings opportunities, there is reason to expect Air Force personnel to have a lower reenlistment rate. However, since many of the background characteristics have already been controlled for in the model, we suspect that the significant coefficients for the service dummy variables may capture yet another set of factors, namely, service-specific environment and circumstances. This will be discussed further in Models II and III.

As we have noted at several points in the preceding sections, our estimates of the pay effects could be distorted by several methodological problems. First, our model implicitly assumes that the characteristics of the respondents with higher pay grades are equivalent to those of respondents with lower pay grades except for the characteristics controlled in the model. It is possible, however, that some service members have an inherent affinity (or "taste") for the military. If so, it is arguable that they would perform more effectively and hence would be promoted faster than others. If this occurred, those people who initially had the most positive attitudes toward military service would eventually achieve higher rank; and their higher reenlistment rates might be derived, not from pay, but from their positive

taste for the military.<sup>1</sup> Hence it is reasonable to expect the pay coefficient to drop further when we control for aspects of taste, as will be seen below.

Overestimation could also occur through confounding military pay level and other aspects of status or rank. Our estimate of regular military compensation depends substantially on the individual's pay grade, and also on his or her dependency status. A high pay grade, in particular, represents something more than a relatively high income. It also represents a large number of perquisites, privileges, and benefits that are attached to higher rank, together with such noneconomic rewards as the respect and deference accorded to rank. We would argue that these status differences are much greater in the military than they are in civilian life, where an individual's position at work is not necessarily reflected in his living quarters, the recreational facilities to which he is admitted, or the social relationships in which he is involved. However, our model assumes that the effect of pay grade on reenlistment is due to the differences in *regular military compensation* that apply to the various grades. If it were true that some of the effect of pay grade on reenlistment came from the status differences between pay grades, our model would probably overestimate the pay coefficient. There is a similar problem with other components of military pay; pay depends not only on pay grade, but also on number of dependents and on years of service. If these attributes are associated with other characteristics that also lead to increased retention, the result could be an overestimate of the pay effect.

A different type of methodological problem could exert a bias in the opposite direction—an underestimate of the pay coefficient. Our data may not have permitted us to control adequately for individual differences in productivity, which might affect a subject's civilian employment opportunities. It is possible that some service members receive higher military pay than others simply because they are more productive. This would be a particular problem if such individuals had enduring characteristics that were not measured in our model (e.g., special abilities, skills, motivation, or ambition). Presumably, such individuals would achieve higher pay grades in the military more quickly. If these same people encountered better civilian opportunities—that is, if civilian employers recognized and rewarded their special attributes—they would be less inclined than others to reenlist. The result would be an underestimate of the effect of military pay.<sup>2</sup>

For several reasons, we would argue that the potential for such a downward bias is probably fairly small in our data. First, our model already contains several measures intended to capture such civilian employment factors as mental ability, education, race, sex, and occupational specialty. Second, only part of the variation in military pay can reasonably be ascribed to such "productivity" selection effects;

<sup>1</sup>Also, some of the variation in years of service (a component of pay) could be associated with length of the initial enlistment term and hence with a basic attitude toward the military. If people with more pro-military attitudes tended to enlist for longer terms (while more indifferent people signed up for only a minimum), that basic "taste" for the military would be associated with the years-of-service component of pay.

<sup>2</sup>This would come about because, when we compared high-pay with low-pay personnel, the high-pay personnel would differ in that they would also face better civilian opportunities. Hence, the difference in reenlistment rates between high-pay and low-pay groups would be less than if the two groups were equivalent in every respect. In terms of our model, this hypothesis suggests there is a bias due to an omitted variable. If the omitted variable (e.g., civilian opportunity) is positively associated with military pay, the bias would be negative if the true coefficient for the omitted variable is negative, or positive if the true coefficient is positive.

certain components of pay that are tied to years of service and dependency status would not be intimately related to productivity. Third, since eligibility for promotion depends on numerous nonperformance factors (including, for example, time in service, time in grade, and occupational specialty), we doubt that productivity plays a highly important role in first-term promotion rates. Finally, we would question whether any such productivity attributes would be constant over time, be relevant to civilian employment, and be visible to civilian employers to such an extent that they would exercise a powerful effect on civilian pay rates. Because of these considerations, we would argue that the effect of unmeasured productivity effects in this sample is probably not very substantial. However, these are matters of judgment, and other interpretations are possible. Certainly, it would be desirable to have more complete data on the civilian employment opportunities of service members to help answer these questions.

The coefficient for the bonus is substantially smaller than the coefficient for regular military compensation. On its face, this would seem anomalous, since one would expect that a dollar's increase in one form of pay should lead to the same effect as a dollar in another form. There are two possible reasons, however, for the lower apparent effect of bonus payments. The first is that the bonus is an additional payment made to those who already are guaranteed a substantial salary. Therefore, its effects might be smaller than the effects of RMC, reflecting the lower marginal utility of a fixed payment as income increases. The second explanation, as we noted in Sec. III, is that the bonus coefficient may be downwardly biased because other characteristics of people working in bonus occupations could be uncontrolled in our model. Bonuses are usually paid to all members of those occupations that are in short supply in the service. Presumably, the short supply comes about because civilian demand for such persons is high, or because something about the job is inherently unattractive. Thus, for example, reenlistment bonuses are paid to electronics technicians because of their abundant civilian opportunities, and to combat arms specialists because the demands of the job result in shortages in that specialty. Since the existence of a bonus for people in such specialties is inherently confounded with the other aspects of the specialty, there is no way to estimate the various independent effects. Possibly, then, the reenlistment bonus coefficient that we observe is the result of two counteracting forces: the positive effect of the bonus and the negative effect of the other factors that necessitated the bonus in the first place. In our judgment, such a situation is surely present, and the true effect of the bonus is probably considerably higher than the coefficient shown in our model.

The second model (Model II) shown in Table 14 includes all military pay, background characteristics, service attributes, and working environment variables. Basically, all the conclusions drawn for the variables from the first model, except NAVY, carry over to this model. The significance of the coefficient of NAVY drops from one to ten percent, when several aspects of working environment are taken into consideration. However, none of these service environment variables shows large influence on reenlistment decisions. Only the group of first-termers who were stationed outside the continental U.S. at the time of the survey have a moderately significant higher reenlistment rate. This group may consist of a selective category of individuals who prefer their non-CONUS assignments.

Model III shows that it is essential to control for the draft pressure to which this group of first-termers was subjected before enlistment. In the past, the general

approach of attracting potential reenlistees by increasing military pay and benefits was sometimes criticized as being ineffective for those who originally enlisted under draft pressure. Preliminary analysis has indicated that most of the coefficients of the variables in the model do not change appreciably with exclusion of the group of first-termers who responded that they definitely or probably would not have enlisted had there been no draft and no military obligation. This is not surprising since only 22 percent of the respondents claimed that they had enlisted under draft pressure. In order to analyze our entire sample of observations, we included in the model a dummy variable designating those with draft pressure. The assumption is that a shift parameter can capture the effect on reenlistment between those who enlisted under draft pressure and those who did not. The extremely significant coefficient for draft pressure indicates that many first-termers who originally enlisted under draft pressure were determined to leave the service at the end of their terms. It should also be noted that the significance of the coefficient of "female" drops slightly when draft pressure is considered, since no women enlisted under draft pressure.

Model III also includes three attitudinal variables intended to represent "taste" for military service. Addition of the three taste variables improves the explanatory power of the model appreciably. The t-values associated with these attitudinal variables are extremely significant. Likelihood of reenlistment increases as attitudes toward the military become more favorable. All the conclusions drawn for the variables in Models I and II continue to hold for Model III. As discussed earlier regarding the possible overestimation of the coefficient of pay, the estimated coefficient of RMC should be more realistic in Model III than in the earlier models, since more of the noneconomic factors influencing reenlistment decision have now been controlled. This argument is supported by noting the reduction in the size of the estimated coefficient of RMC from 0.68 in Models I and II to 0.60 in Model III.

The results show that being a specialist in an occupation field that is predisposed to detrimental rotational patterns exerts a moderately significant negative effect on retention. This finding is consistent with other ongoing Rand research in military occupational management.<sup>3</sup> Even after controlling for other factors that are frequently cited as affecting the imbalanced occupational specialties—time spent outside CONUS, time separated from family, and long working hours—the imbalanced rotation variable holds its significance level of approximately 10 percent in Model III. It may be that this variable is capturing the anticipated effects of remaining in an undesirable career field beyond the reenlistment point. If the first-term specialist has heard about detrimental rotation patterns experienced by the career force in his or her specialty, the decision to reenlist may be negative even though the person's actual experience as a first-term was similar to those in balanced specialties. This analysis suggests, therefore, that membership in specialties with geographic imbalances characteristic of rotation-related problems has some effects on first-term retention and merits further investigation.

<sup>3</sup>See Smith (1979) for more detailed discussion of the topic.

## IMPLICATIONS OF THE MODEL

The coefficients of the reenlistment model just presented are useful because they provide a general assessment of the importance of the factors that we have considered. However, the model may be used for more specific purposes as well. In particular, we can use the model to calculate the predicted reenlistment rate for any given set of values of the independent variables. Such calculations yield a measure of the extent to which the reenlistment rate would be affected if the DoD or others made policy changes that altered the factors included in the reenlistment model. For example, we can estimate the effect of increasing general compensation levels, of changing the visibility of compensation, or of reducing the frequency of family separation in the force.<sup>4</sup> We have carried out a number of such analyses to illustrate concrete results of the model and to draw out the policy implications of this study. Several significant implications have emerged.

### The Importance of Military Pay

First, the model suggests strongly that the level of military compensation has a substantial effect on the reenlistment rate. Suppose, for example, that the total pay for each member of the service were increased by 10 percent. Calculations using Model III in Table 14 imply that the reenlistment rate would increase from 0.225 to 0.312 (39 percent) if such an across-the-board 10-percent increase were implemented.<sup>5</sup> Thus, even a moderate pay increase would lead to a substantial increase in the reenlistment rate, if military service personnel behaved according to this model's predictions.

We caution that these estimates of the response of reenlistments to pay changes could be sensitive to the assumptions of our model. As we discussed at length earlier in this section, the pay coefficient, like other coefficients, could be substantially biased if the model omits variables that have important effects. We have attempted to assess the possible range of such biases by constructing models with different sets of variables. In the extreme, we obtained relative increases in the reenlistment rate ranging between about 39 and 44 percent as the result of a 10-percent pay increase, when we made reasonable changes in the variables included in the model.<sup>6</sup> Given the available data, Model III in Table 14 appears to be the most reasonable one, but

<sup>4</sup>To project the results of policy changes with a nonlinear model, one must evaluate the function under two different conditions: a "base case" and an altered condition. A common procedure, frequently used with linear regression, is to take the set of sample means on the independent variables as the base case, and then to examine the changes induced by varying those means. However, in a nonlinear model the value of the function at the means of the independent variables may not equal the sample reenlistment rate (in our data, the former was approximately .28, the latter .225); thus, the base case is a somewhat artificial point that does not reflect existing reenlistment rates. In addition, the slope (the rate of change of the reenlistment function) varies, depending on the point at which the function is evaluated. To circumvent these problems, we chose to estimate the effects of policy changes by evaluating the function for each individual person, first under the current condition (using that person's actual characteristics), and then under the altered condition. Our estimate of the total reenlistment rate in each condition was then derived by taking the mean of the function values for all individuals in the sample.

<sup>5</sup>This estimate was made by evaluating the reenlistment function shown in Table 14 for each individual in the sample, assuming that his total pay value was multiplied by a factor of 1.1. Since bonus values are tied to basic pay, bonuses were also increased appropriately. The arithmetic mean of the resulting probabilities was 0.312. (If pay were increased 10 percent without any change in the bonus, the reenlistment rate would be 0.308.) Missing entries were replaced by the corresponding mean values.

<sup>6</sup>The lowest pay coefficient was observed in Model III of Table 14, and the highest in Model II.

there is still some uncertainty about the precise size of the pay effect. Indeed, we would argue that even 39 percent may be an overestimate, because of the methodological problems cited above. The most satisfactory solution would be to be able to change the one variable of interest (say, the level of pay) without changing any others, as in an experiment. However, given the difficulties of carrying out such studies, we have accepted the limitations of the data available and attempted to estimate the range of possible errors.

### Perceptions of Military Compensation

A second important implication of the model is the *lack* of importance that it shows for perceptions of military compensation. As discussed in Sec. III, many first-term personnel substantially underestimate their regular military compensation—on the average, at only 78 percent of its stated value. These perceptual errors were modeled by including a term for the difference between the person's perceived value of compensation and the actual value, assuming that the person was receiving the allowances in cash. The coefficient for this variable, which represents the extent to which perceptions underestimate actual values, was fairly weak compared with total pay, although significant at the 0.01 level. When our sample members came to the point where they had to decide on reenlistment, they behaved as though their actual levels of compensation, and not their perceptions, were the principal factor in the decision.

These results are relevant to an important policy issue—namely, the choice between a "salary system" and the current system. We used our model to estimate what would happen to reenlistment rates if steps were taken to reduce servicemen's underestimation of the value of their compensation. One possible step would be to pay all of the current regular military compensation in cash. This would eliminate the effects for in-kind benefits shown in Table 14, and it might also bring perceptions into better agreement with reality, since personnel would then receive a paycheck showing the exact amount of their pre-tax compensation. Our model indicates that the reenlistment rate under these circumstances would increase to 0.249—only a modest increment (11 percent) above the current rate of 0.225.<sup>7</sup> A second possibility would be to retain the in-kind payments and the present allowance system, but to take other steps to make the value of compensation more visible. For example, the value of RMC shown in the pay tables could be transmitted to every service member (perhaps printed on the paycheck). If such a scheme succeeded in eliminating perception errors, the model implies that the reenlistment rate would be 0.246.

In short, the effects of perception errors shown by our model are so small that reenlistment would increase by only about two percentage points, even if perception errors were eliminated entirely. Changing to a salary system would have a similar modest effect. If one accepts these estimates, it is difficult to see how the increase in reenlistments resulting from a salary system would outweigh the considerable costs and dislocations that would be incurred in establishing it.

<sup>7</sup>This estimate was made by evaluating the reenlistment function using the coefficients shown in Table 14 by imposing the constraint that the coefficients for in-kind compensation and the difference between perceived and actual compensation be equal to zero.



### Effects of Service Environment

A third significant implication of the reenlistment model is suggested by the modest size of the coefficients for all of the "service environment" factors. It appears that most of the aspects of service environment measured in this study—working in a rotation-imbalanced specialty, family separations, stationing outside the United States, and long hours of work—have very little detrimental effect on reenlistment rates. It is often suggested that personnel policies contribute to low reenlistment rates by increasing the frequency of rotation, family separation, and so forth. These problems can never be fully eliminated from military service, but they could be reduced, for example, by reducing the number of personnel whom they affect. We estimated the impact of policy changes in these areas by calculating the impact of a 50-percent and a 100-percent increase in the number of personnel affected by a particular aspect of the environment. For example, to examine the effect of a policy change relating to rotation, we assumed that the number of personnel identified as working in rotation-imbalanced specialties would increase from 9.8 percent to 14.7 percent or to 19.6 percent.<sup>a</sup> For each of the four factors listed above, the predicted total reenlistment rate under the policy change of 50 percent was between 0.222 and 0.229, compared with the rate of 0.225 under existing policies. For the 100-percent change, the predicted rates were between 0.220 and 0.236—a relative change of less than 5 percent compared with the current rate. We conclude that changes of this magnitude in policies affecting rotation, family separation, U.S. location, or hours of work would be unlikely to raise the first-term reenlistment rate beyond these limits.

### Survey Intention Versus Behavior

Finally, we have a general conclusion about the utility of survey data in the study of reenlistment. We found that the survey responses given by our subjects could be related directly to their later reenlistment behavior with reasonable success. Moreover, the results conform to commonsense expectations, as well as being consistent with those of studies using other methodologies (e.g., Enns, 1977; Nelson, 1970). More important, we found that the reenlistment *intentions* expressed by survey respondents corresponded closely to their actual reenlistment *behavior* up to one year later. In fact, when respondents were asked to rate the probability that they would reenlist, their answers on the average were nearly identical to their actual probability of reenlisting when they were followed up. These results apply only to people within one year of reenlistment, since we did not obtain followup data on persons who were more than one year from the reenlistment point at the time of the survey. Nevertheless, the closeness of the match between intentions and actual behavior implies that the results of survey studies that use reenlistment intentions as the criterion may be accepted with reasonable confidence.

<sup>a</sup>To make these estimates, we evaluated the reenlistment function in Table 14 separately for all individuals in two categories of personnel: those who had experienced the aspect of service environment (family separation, working in rotation-imbalanced specialties, stationing outside the United States, or long hours of work) and those who had not. We then computed the expected reenlistment rate for each category by taking the mean of these individual probabilities. Finally, we estimated the total force reenlistment rate by calculating the weighted mean of the two categories' reenlistment rates, using weights that reflected the altered composition of the force if the given aspect of service environment were changed by 50 percent or 100 percent.

## Appendix A

### ALTERNATIVE MODELS OF REENLISTMENT

#### ASSESSMENT OF PERCEIVED CIVILIAN EARNINGS OPPORTUNITY

Question 40, which asked respondents what civilian salary they expected to receive if they left the service and took civilian jobs at the time of the survey, is an appealing measure for understanding the civilian earnings opportunities that each individual perceived. Unfortunately, we judged that the responses failed to accomplish this task in many respects.

First, since our sample of first-termers was aged around 21 to 24, the majority of them had no previous work experience and their ability to measure potential earnings in the civilian sector is dubious. Even after adjusting for obvious response errors in monthly earnings provided by respondents (e.g., responses that appeared to represent annual rather than monthly figures), over 15 percent of these adjusted values, which will be referred to as the perceived monthly civilian earnings, were missing or invalid. Furthermore, many subjects did not provide consistent responses to Questions 40 and 42 (i.e., Q40 was not less than Q42). In addition, a small proportion of the responses were zero. This reflects that either they perceived a gloomy outlook of the civilian market for the next three years, or, being ignorant of pay levels in the civilian sector, they simply answered with some random figure. Hence, at the outset, the reliability of their responses as measures of the actual civilian earnings opportunities appeared fairly low.

When the cumulative distributions of the perceived monthly civilian earnings were computed for the respondents categorized according to race and education level, as shown in Table A.1, we found that white non-high-school graduates expected higher earnings than high school graduates, and their figures were similar to those who had some college training. Nonwhites perceived lower potential in civilian earnings than whites—a perception that seems quite reasonable at first glance. The differences in median earnings were -\$150, -\$50, -\$50, and -\$100 for the four levels of educational attainment, respectively. However, when we further examined the reenlistment rates associated with these perceived earnings, we found that prospective reenlistees who perceived higher civilian income and who were better educated tended to have *higher* reenlistment rates (not lower). In Table A.2, reenlistment rates are higher, for example, for whites who believed they could make over \$1000 per month, and for nonwhites with college degrees. This simple cross-tabulation strengthens our reservation in using these data.

To further investigate the effect of this perceived civilian earnings variable (CIVEARN) on reenlistment decision, with or without controlling for other factors, logistic regression was run separately on three sets of explanatory variables. The regressions were run first with CIVEARN alone, then simultaneously with military pays, and finally with background characteristics and service attributes added. The

Table A.1  
PERCEIVED VALUE OF POTENTIAL CIVILIAN EARNINGS

Value of Perceived Monthly Earnings <sup>a</sup> (\$)	Cumulative Percentage Distribution of Civilian Earnings							
	White				Nonwhite			
	Non- High School Grad (%)	High School Grad (%)	Some College (%)	College Grad (%)	Non- High School Grad (%)	High School Grad (%)	Some College (%)	College Grad (%)
≤400	5.7	5.8	4.0	1.9	9.2	9.1	7.8	0.0
450	6.4	7.2	5.2	1.9	10.8	10.8	10.0	0.0
500	12.7	16.5	12.5	3.8	26.2	21.9	15.6	5.6
550	14.6	18.9	14.0	3.8	32.3	25.6	17.2	5.6
600	28.7	32.0	23.7	7.6	47.7	39.1	31.1	11.1
650	34.1	36.3	27.9	10.5	53.8	44.1	35.0	16.7
700	40.1	46.7	38.5	20.0	60.0	55.6	47.2	38.9
750	43.9	50.0	42.9	22.9	63.1	59.9	52.2	38.9
800	61.5	64.6	58.5	38.1	76.9	72.7	65.6	50.0
850	65.0	67.8	63.1	40.0	78.5	75.4	70.0	50.0
900	72.3	73.8	71.4	53.3	84.6	80.8	77.8	77.8
950	74.2	75.8	73.6	57.1	84.6	82.2	79.4	77.8
1000	85.4	87.1	86.7	79.0	93.8	92.6	90.6	77.8
1050	86.0	87.5	87.6	79.0	93.8	92.6	91.1	77.8
1100	87.9	89.3	90.1	81.0	93.8	94.3	92.2	83.3
1150	88.5	89.6	90.4	81.0	93.8	94.6	92.2	83.3
1200	91.4	94.3	94.9	86.7	93.8	96.6	94.4	88.9
1250	91.4	94.8	95.9	89.5	95.4	97.3	96.1	88.9
1300	91.7	95.2	96.6	91.4	95.4	97.6	96.7	88.9
1350	92.0	95.4	96.8	92.4	95.4	97.6	96.7	94.4
1400	92.4	96.0	97.4	93.3	96.9	98.0	97.2	94.4
1450	92.4	96.1	97.4	93.3	96.9	98.0	97.8	94.4
≥1500	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Median (N)	800 (314)	750 (1506)	800 (970)	900 (105)	650 (65)	700 (297)	750 (180)	800 (18)

<sup>a</sup>Value rounded to nearest \$50.

results of these regressions are shown in Table A.3. The likelihood of low reliability of responses provided in Q40 is best illustrated in column 2 of Table A.3. If CIVEARN is of any reasonable quality, its coefficient should never be associated with a positive sign, even though it may not be highly significant. We appreciate the fact that people make these self-evaluations of their potential earnings in the civilian market under the assumption that they can readily find jobs, without having to take into account their real chances of getting them; but a positive sign implies that the higher the perceived civilian earnings, the more likely is the person to remain in service, which contradicts common sense. When military pay variables, background characteristics, and service attributes are also included in the model, as shown in columns three and four, the coefficient of CIVEARN remains positive and shows moderate significance in the latter case. Hence, we conclude that the quality of the responses provided on the survey regarding civilian earnings is so suspect that we are forced to abandon the thought of attempting to use them for measuring civilian earnings opportunities. Consequently, alternative measures were used to

**Table A.2**  
**REENLISTMENT RATE BY PERCEIVED CIVILIAN EARNINGS**

Value of Perceived Monthly Earnings (\$)	Reenlistment Rate <sup>a</sup>							
	White				Nonwhite			
	Non- High School Grad	High School Grad	Some College	College Grad	Non- High School Grad	High School Grad	Some College	College Grad
≤ 600	.250 (88)	.182 (479)	.143 (230)	.125 (8)	.387 (31)	.313 (115)	.164 (55)	.500 (2)
601-800	.295 (105)	.220 (492)	.177 (334)	.156 (32)	.526 (19)	.257 (101)	.290 (62)	.286 (7)
801-1000	.307 (75)	.221 (340)	.163 (276)	.093 (43)	.091 (11)	.288 (59)	.348 (46)	.200 (5)
≥ 1001	.304 (46)	.221 (195)	.185 (130)	.182 (22)	.000 (4)	.273 (22)	.412 (17)	.500 (4)
Total	.287 (314)	.208 (1506)	.166 (970)	.133 (105)	.354 (65)	.286 (297)	.278 (180)	.333 (18)

<sup>a</sup>Based on number of valid responses given in parentheses.

capture expected civilian earnings opportunities, as discussed in Sec. III and under the next heading.

### ALTERNATIVE MEASURES OF CIVILIAN EARNINGS OPPORTUNITIES

An alternative approach to estimating civilian earnings opportunities is to construct measures of average hourly wage and unemployment rates from the 1976 Current Population Survey (CPS) data. We are aware that the data source consists of earnings reported by people selected from the general U.S. population, not from the target population of service separatees, who may have accumulated job skills. However, such experience accumulated from particular military skills is relevant only to the civilian wage rate in the short run and only if directly transferable to a related civilian job. Over longer periods of time, individual characteristics such as educational attainment and mental ability are likely to be more important than prior military experience. Our assumption is that the short-term effect of experience accumulated in the service by this group of first-termers will soon be phased out over the period of the second term, and that only individual characteristics are likely to matter in determining an individual's potential earnings. We compute the average hourly wage rate based on the 1976 CPS data, grouped by education, sex, race, and age. By assuming a normal 40-hour workweek, we then construct an estimate of the annual earnings (CIVPAY).

The influence of civilian earnings opportunities on the reenlistment decision

Table A.3  
REGRESSION OF REENLISTMENT DECISION AGAINST PERCEIVED  
CIVILIAN EARNINGS

Variable	Coefficients and t-Values		
	Model I	Model II	Model III
Constant	-1.4635	-3.9274	-6.7479
CIVEARN x 10 <sup>-3</sup>	0.0172 (1.45)	0.0048 (0.40)	0.0234 (1.87) <sup>c</sup>
RMC x 10 <sup>-3</sup>		0.2706 (2.26) <sup>b</sup>	0.6812 (5.24) <sup>a</sup>
DIFFRMC x 10 <sup>-3</sup>		0.0090 (2.85) <sup>a</sup>	0.1113 (3.42) <sup>a</sup>
BAS		0.1943 (2.00) <sup>b</sup>	-0.0553 (-0.51)
SINGLEQTR		-0.1343 (-0.80)	0.0119 (0.07)
FAMILYQTR		0.5259 (2.98) <sup>a</sup>	0.5672 (3.14) <sup>a</sup>
DEP		0.2362 (1.37)	0.1006 (0.55)
BONUS x 10 <sup>-3</sup>		0.3010 (2.48) <sup>b</sup>	0.3555 (2.76) <sup>a</sup>
HSGRAD			-0.4221 (-2.89) <sup>a</sup>
COLL			-0.7218 (-4.60) <sup>a</sup>
AFQTLGT			-0.1692 (-3.75) <sup>a</sup>
FEMALE			0.9125 (4.81) <sup>a</sup>
NONWHITE			0.5135 (4.23) <sup>a</sup>
ELECTRON			-0.2667 (-2.02) <sup>b</sup>
AF			-0.5302 (-4.37) <sup>a</sup>
NAVY			-0.2687 (-2.14) <sup>b</sup>

NOTE: See Table 13 for definitions of the variables unless specified. CIVEARN denotes the potential civilian earnings perceived by each respondent, given in survey Question 40.

<sup>a</sup>Significant at 1%.

<sup>b</sup>Significant at 5%.

<sup>c</sup>Significant at 10%.

may also rely heavily on the person's chance of getting a civilian job. Even though the average earnings may be high for full-time workers with certain characteristics, it may happen that the unemployment rate among that group of individuals is relatively high. If so, utilizing only the expected civilian earnings will not fully capture the true civilian earnings opportunities; the unemployment rate should also be considered. The unemployment rate (UNEMP) for each group is also computed from the 1976 CPS data. Although average earnings and unemployment ratios are somewhat correlated, they measure different aspects of civilian earnings opportunities and it may therefore be useful to keep them separate in the model.

The three regression models shown in Table 14 are replicated in Table A.4, except that the two derived measures CIVPAY and UNEMP are included in lieu of the background characteristics. The results in Table A.4 show virtually no difference when compared with the results in Table 14. The one exception is the variable

**Table A.4**  
**REENLISTMENT DECISION MODEL WITH ALTERNATIVE MEASURES OF**  
**CIVILIAN EARNINGS OPPORTUNITIES**

Variable	Coefficients and t-Values		
	Model I	Model II	Model III
Constant	-6.5164	-6.6067	-6.1127
RMC x 10 <sup>-3</sup>	0.7170 ( 5.96) <sup>a</sup>	0.7136 ( 5.91) <sup>a</sup>	0.6280 ( 4.94) <sup>a</sup>
DIFFRMC x 10 <sup>-3</sup>	0.0956 ( 3.34) <sup>a</sup>	0.0971 ( 3.38) <sup>a</sup>	0.0811 ( 2.70) <sup>a</sup>
BAS	-0.0345 (-0.36)	-0.0625 (-0.64)	-0.0578 (-0.57)
SINGLEQTR	-0.0474 (-0.30)	-0.0223 (-0.14)	0.0327 ( 0.20)
FAMILYQTR	0.4738 ( 2.94) <sup>a</sup>	0.4744 ( 2.94) <sup>a</sup>	0.4675 ( 2.77) <sup>a</sup>
DEP	0.1251 ( 0.76)	0.1111 ( 0.65)	0.1341 ( 0.76)
BONUS x 10 <sup>-3</sup>	0.2636 ( 2.30) <sup>b</sup>	0.3109 ( 2.64) <sup>a</sup>	0.3153 ( 2.56) <sup>b</sup>
CIVPAY x 10 <sup>-3</sup>	-0.1343 (-3.46) <sup>a</sup>	-0.1318 (-3.39) <sup>a</sup>	-0.1010 (-2.46) <sup>b</sup>
UNEMP	0.2418 ( 3.61) <sup>a</sup>	0.2477 ( 3.68) <sup>a</sup>	0.2550 ( 3.62) <sup>a</sup>
ELECTRON	-0.4039 (-3.41) <sup>a</sup>	-0.3903 (-3.27) <sup>a</sup>	-0.3294 (-2.64) <sup>a</sup>
AF	-0.5448 (-5.03) <sup>a</sup>	-0.4793 (-4.21) <sup>a</sup>	-0.3780 (-3.16) <sup>a</sup>
NAVY	-0.3238 (-2.88) <sup>a</sup>	-0.2277 (-1.88) <sup>c</sup>	-0.1558 (-1.23)
NONUS		0.1896 ( 1.83) <sup>c</sup>	0.1845 ( 1.71) <sup>c</sup>
FAMSEP		0.1266 ( 0.95)	0.1943 ( 1.40)
HOURS		-0.0533 (-0.61)	0.0784 ( 0.86)
ROTATION		-0.2643 (-1.95) <sup>c</sup>	-0.2898 (-2.05) <sup>b</sup>
DRAFT			-0.5617 (-5.36) <sup>a</sup>
MILITJOB			0.3005 ( 7.02) <sup>a</sup>
RULES			0.3880 (10.05) <sup>a</sup>
PROMOTION			0.2053 ( 5.71) <sup>a</sup>

NOTE: See Table 13 for definitions of all variables except CIVPAY and UNEMP.

<sup>a</sup>Significant at 1%.

<sup>b</sup>Significant at 5%.

<sup>c</sup>Significant at 10%.

ELECTRON. When background characteristics are controlled for, this variable shows only moderate significance at 10 percent. However, when the two derived civilian earnings variables are used in the model, the coefficient of ELECTRON reveals high significance. This is understandable, since no skill nor specialty is used to evaluate CIVPAY and UNEMP. Hence, the high marketability of electronics repairmen is plausibly captured by this variable. It is also interesting to note that the overestimation of the coefficient of RMC we discussed in Sec. IV is again indicated here. The coefficient of RMC drops from 0.71 to 0.63 when some "taste" variables are controlled for. Nevertheless, without directly controlling for background characteristics that are better proxies for the true civilian earnings oppor-

tunities than CIVPAY and UNEMP, the size of the coefficient of RMC in Table A.4 is larger than that in Table 14.

### REENLISTMENT INTENTION MODEL

The three models presented in Sec. IV are replicated in Table A.5, except that we use the logit transformation of the survey intention as the dependent variable, instead of the 0-1 reenlistment decision. The reenlistment intention model takes on the form

$$\text{logit}(p_i) = \log(p_i/(1 - p_i)) = \beta_0 + \beta_1 x_{i1} + \dots + \beta_k x_{ik} + \epsilon_i.$$

As discussed in Sec. II, nine probability categories about reenlistment intention were included in the 1976 DoD survey questions. Respondents were asked to select the probability level that best approximated their reenlistment intentions at the time of the survey. The values of 0.05 and 0.95 are assigned to those who responded "no chance, very slight possibility (1 in 10 or less)" and "certain, almost sure (9 in 10 or better)" respectively. The logit transformation is chosen for several reasons. First, this transformation magnifies the differences of the tail probabilities. Notice that this transformation is almost equivalent to a linear transformation in the middle range of  $p$ , say, between 0.3 to 0.7. Second, it is a symmetric transformation around 0.5. Third, running ordinary least squares regression to this model mimics the estimation technique we adopted for the logit model of dichotomous reenlistment decision.

Table A.5 reveals similar significance of the coefficients in the reenlistment intention model as in the reenlistment decision model shown in Table 14. Noticeable differences are as follows:

1. The coefficient of DIFFRMC is only one-fourth the size of that of RMC instead of one-sixth as shown in Table 14. This suggests that the perceived value of RMC has a larger effect on expressed intention than on actual behavior. As a matter of fact, the coefficient of RMC is reduced by 45 percent in the intention Model III, when "taste" variables are controlled for.
2. The effect of BONUS is also more highly observable in the intention model than in the decision model. The ratio of the coefficient of BONUS to that of RMC runs from 68 to 106 percent as compared with 50 to 62 percent in the decision model.
3. Electronic repairmen provided significantly lower reenlistment intention than others, even when many factors are controlled for.
4. Those who worked in specialties that are rotation-imbalanced show no difference in reenlistment intention from others, whereas a moderately significant difference is observed in the reenlistment decision model.

By and large, we conclude that the factors affecting intention also have a major effect on actual behavior, and vice versa. This is supported by the fact that when we add intention probability as an independent variable to the reenlistment decision model, almost all variations are captured by this intention variable. Hence, the

closeness of the match between intentions and actual behavior, and the similar influences of many factors on them, implies that the results of survey studies that use reenlistment intention as the criterion may be accepted with reasonable confidence.

Table A.5  
COEFFICIENTS OF THE REENLISTMENT INTENTION MODEL

Variable	Coefficients and t-Values		
	Model I	Model II	Model III
Constant	-40.7560	-41.4192	-26.9639
RMC x 10 <sup>-3</sup>	3.3419 (3.81) <sup>a</sup>	3.3609 (3.82) <sup>a</sup>	1.8606 (2.27) <sup>b</sup>
DIFFRMC x 10 <sup>-3</sup>	0.8370 (5.88) <sup>a</sup>	0.8461 (3.91) <sup>a</sup>	0.5840 (2.92) <sup>a</sup>
BAS	-0.5874 (-0.82)	-0.8637 (-1.17)	-0.7687 (-1.13)
SINGLEQTR	0.4101 (0.34)	0.5142 (0.43)	0.5259 (0.48)
FAMILYQTR	2.7897 (2.30) <sup>b</sup>	2.8103 (2.32) <sup>b</sup>	2.3472 (2.10) <sup>b</sup>
DEP	1.8439 (1.48)	1.6311 (1.27)	1.4227 (1.20)
BONUS x 10 <sup>-3</sup>	2.2852 (2.64) <sup>a</sup>	2.3507 (2.65) <sup>a</sup>	1.9797 (2.42) <sup>b</sup>
HSGRAD	-2.8519 (-2.92) <sup>a</sup>	-2.9587 (-3.02) <sup>a</sup>	-2.5236 (-2.80) <sup>a</sup>
COLL	-4.5007 (-4.26) <sup>a</sup>	-4.6346 (-4.38) <sup>a</sup>	-3.5764 (-3.64) <sup>a</sup>
AFQTLGT	-1.7226 (-5.62) <sup>a</sup>	-1.6927 (-5.51) <sup>a</sup>	-1.3449 (-4.74) <sup>a</sup>
FEMALE	4.6546 (3.84) <sup>a</sup>	4.5929 (3.77) <sup>a</sup>	1.0106 (0.89)
NONWHITE	5.4256 (6.84) <sup>a</sup>	5.4148 (6.81) <sup>a</sup>	4.4605 (6.07) <sup>a</sup>
ELECTRON	-2.6380 (-2.86) <sup>a</sup>	-2.6564 (-2.87) <sup>a</sup>	-2.2141 (-2.59) <sup>a</sup>
AF	-3.5489 (-4.37) <sup>a</sup>	-3.0831 (3.60) <sup>a</sup>	-1.7583 (-2.21) <sup>b</sup>
NAVY	-2.9297 (-3.47) <sup>a</sup>	-2.2611 (-2.49) <sup>b</sup>	-1.4262 (-1.70) <sup>c</sup>
NONUS		1.6629 (2.13) <sup>b</sup>	1.4575 (2.03) <sup>b</sup>
FAMSEP		1.0107 (1.01)	1.5634 (1.70) <sup>c</sup>
HOURS		-0.2862 (-0.44)	0.9000 (1.49)
ROTATION		-0.4469 (-0.44)	-0.6496 (-0.69)
DRAFT			-4.8196 (-6.93) <sup>a</sup>
MILITJOB			2.6003 (9.15) <sup>a</sup>
RULES			3.5935 (13.95) <sup>a</sup>
PROMOTION			2.4306 (10.19) <sup>a</sup>

NOTE: See Table 13 for definitions of all variables.

<sup>a</sup>Significant at 1%.

<sup>b</sup>Significant at 5%.

<sup>c</sup>Significant at 10%.



## **Appendix B**

### **DESIGN OF THE SURVEY**

The basic sample design for the 1976 DoD survey was the outcome of a joint process affected by several parties concerned with reenlistment issues. The broad outlines of the survey design were originally proposed by The Rand Corporation, which had been asked by OASD(MRA&L) to suggest data sources relevant to compensation and reenlistment issues. The staff of the Third Quadrennial Review of Military Compensation (QRMC) also were interested in the survey because of their concern with estimating the subjective value of military compensation as viewed by military personnel. As a result, Rand staff and the QRMC staff collaborated in advising the Defense Manpower Data Center (DMDC) on the sample design. DMDC had primary responsibility and authority for survey design and administration.

#### **SAMPLING PLAN AND RESPONSE RATES**

The plan for sampling stratification, as implemented by DMDC, is shown in Table B.1. The sample was stratified in three dimensions: *years of service*; *time remaining to the expiration of term of service (ETS)*; and *branch of service*. Because interest at that time centered on first-term reenlistments, the largest sample sizes were planned for the category that was most likely to contain first-termers: those with fewer than four years of service accumulated at the time of the survey. Within this group, the population was subdivided according to the amount of time to ETS. A large sample was drawn from those personnel having less than one year remaining, since such persons would reach the actual reenlistment decision point by the time of the one-year followup that was planned. Much smaller samples were drawn within other personnel groups because analysis plans did not call for intensive examination of their reenlistment behavior.

The cell sizes in this sampling plan were designed so that the sizes of the obtained samples within each cell would be large enough, at a minimum, to permit sample estimates of population proportions that would deviate from the true proportion by not more than 0.05 with a 95 percent level of confidence. This implied that each cell should contain at least 390 cases. In the cell of greatest interest—personnel with less than four years of service and less than one year to ETS—a further constraint was imposed: namely, that the cell size be large enough to permit isolating a subgroup that constituted as little as 15 percent of the total cell with the same level of precision in the estimates. Within these particular cells, then, the plan required approximately 2600 completed, usable questionnaires returned.

DMDC survey personnel anticipated that gross response rates for the survey would be in the range of 40 to 60 percent. One major factor that depresses response rates is the tendency for all sources of sample lists to contain numerous individuals whose locations have changed since the last time the files were updated. This leads

**Table B.1**  
**SAMPLE DESIGN AND RESPONSE RATES**

Years of Service	Time Remaining in Term of Obligated Service	Item	Army	Navy	Air Force	Marine Corps	Total DoD
0-3	Under 1 year	Sample drawn	5,200	6,626	5,200	6,190	23,216
		Response rate	41	27	54	37	39
	1 year or more	Sample drawn	800	915	800	952	3,467
		Response rate	50	84	65	33	57
4-7	Under 1 year	Sample drawn	800	1,011	800	952	3,563
		Response rate	54	38	59	41	47
	1 year or more	Sample drawn	800	977	800	952	3,529
		Response rate	69	59	66	46	59
8-14	Under 1 year	Sample drawn	800	997	800	952	3,549
		Response rate	61	44	62	45	52
	1 year or more	Sample drawn	800	1,004	800	952	3,556
		Response rate	80	66	68	46	64
15 or more	Under 1 year	Sample drawn	800	998	800	952	3,550
		Response rate	63	40	71	45	53
	1 year or more	Sample drawn	800	1,011	800	952	3,563
		Response rate	76	70	67	50	65
Total	Under 1 year	Sample drawn	10,800	13,539	10,800	12,854	47,993
		Response rate	54	42	61	41	49

to many cases in the sample who are unlocatable because the addressee is unknown, has left the service, etc. For the 1976 DoD Personnel Survey, DMDC found it infeasible to record these reasons for individual cases, making it impossible to compute a net response rate. However, if it had been possible to remove those sample members who were technically not in the sampling frame, the response rate would certainly have been higher.

Because of the likely nonresponse levels, DMDC drew much larger initial samples than were required for analysis purposes. For example, as shown in Table B.1, DMDC drew 5200 Army personnel with less than four years of service and less than one year to ETS. This reflected the assumption that approximately 50 percent of the sample would return a usable questionnaire, yielding 2600 cases. In the other Army cells, 800 cases were drawn, with the assumption that approximately 400 cases would be returned in usable form. In the Navy and the Marine Corps, slightly lower response rates were anticipated and therefore the sizes of the samples drawn were proportionately higher.

As Table B.1 shows, the actual response rates achieved were somewhat lower than those anticipated. Across the entire DoD, the response rate for the most important cell (0-3 years of service and less than one year to ETS) was 39 percent. This did not seriously affect the precision of estimates that we wished to make, but it did raise the question of possible biases due to nonresponse.

To examine possible nonresponse bias, DMDC compared the obtained sample with DoD population records from the personnel files on several background variables that are frequently thought to be especially subject to nonresponse bias. Table B.2 shows the results of the most important of these comparisons. It shows the characteristics of the sample survey respondents compared with characteristics of the DoD population for our most important subgroup (those with less than four years of service). No further comparisons or complex modeling of nonresponse biases was possible, because DMDC did not maintain a record of the individuals who responded versus those who did not respond. In general, the results from the sample members who returned the survey are within five to ten percentage points of the population figures, with the exception of the Army, where two differences of 12 percentage points are recorded. In our judgment, these differences are not large enough to cause serious concern with sample bias on background characteristics, particularly since in our models we will control for such factors. However, the size of the response rates and the possibility of biases on other variables that are not measured in this table suggest that future surveys should take all possible steps to increase response rates.

Table B.2  
CHARACTERISTICS OF SAMPLE SURVEY RESPONDENTS AND  
CORRESPONDING POPULATION<sup>a</sup>

Service	Characteristic	Percent with the Characteristic	
		Sample Survey Respondents	Population
Army	Unmarried	67	69
	Non-high-school graduate	13	25
	Nonwhite	15	27
Navy	Unmarried	69	79
	Non-high-school graduate	11	17
	Nonwhite	8	12
Air Force	Unmarried	56	61
	Non-high-school graduate	3	5
	Nonwhite	16	16
Total	Unmarried	64	70
	Non-high-school graduate	9	16
	Nonwhite	13	18

<sup>a</sup>Service members with less than four years of service only.

## DATA COLLECTION PROCEDURES

The questionnaire form, reproduced in App. C, was designed to minimize the costs of processing and administration by being suitable for self-administration and for optical scanning. The form was printed as a booklet, with both questions and spaces for recording answers printed within the booklet; the respondent would fill out the booklet and return it, after which the booklet would be burst, scanned, and

transcribed directly onto computer tape. The procedures of administration, however, varied by service as follows.

In the Army and Navy, DoD supervised the drawing of individual names and Social Security numbers from Service central files; individuals returned completed questionnaires directly to DoD through the mail. In the Marine Corps and the Air Force, the services drew the individual names and numbers and handled the distribution and return of forms. The Marine Corps and the Air Force shipped batches of forms directly to local installations, where group administration or mailing of forms was used, depending upon the rank of the individual. Generally, lower-ranking personnel were called to complete forms in groups while higher-ranking personnel received and returned forms through the mail. The Air Force, alone among the four services, kept a tally of the number and characteristics of sample members who were unreachable because of absence (including mostly persons who were assigned elsewhere on temporary duty, permanently stationed elsewhere, or on leave during the administration period). These types of "unreachable" respondents are generally very similar to those who are available, since such absences are virtually random events in the aggregate; for that reason the Air Force considers such persons excluded from the survey population. Such persons constituted about 12 percent of the Air Force initial sample. It is likely that these figures are conservatively low; other recent Rand experience suggests that 15 to 20 percent of service personnel are unreachable at any given time.

In addition, a two-wave followup procedure was instituted for the Army sample. For the Army, DoD kept a record of the receipt of each return from the field, and prepared a second mailing of forms to persons who had not responded within a few weeks of the first mailing. This procedure was instituted because previous experience suggested that the Army returns are among the most difficult to obtain. Unfortunately, budget and operating constraints of the services precluded using such a procedure in the Navy, Marine Corps, or Air Force. There is every reason to believe that a second-wave mailing is desirable in future surveys as well. Data provided by DMDC showed that after the first mailing to the Army, the response rate was only 36 percent. The second mailing increased the total response rate by one-half, to 54 percent.

The actual administration of the survey took place beginning in April 1976, with some local installations continuing survey activities until June. Social Security Numbers were recorded by the respondents on the form, providing the means for following them up after one year. (About 20 percent of respondents failed to give an SSN, or gave an SSN that was invalid or did not match any personnel file records. However, these respondents did not differ systematically from other respondents on any of the principal variables used in this study.) The respondents were not recontacted for the followup. Rather, their personnel records were obtained from DoD Master and Loss files for March 31, 1977. As discussed in Sec. II, reenlistments and voluntary separations were determined from data in these records showing ETS dates and separation codes (reasons for departing from the service).

## Appendix C

### DEPARTMENT OF DEFENSE PERSONNEL SURVEY

(Form A)

DCS: DD-20(07)701



The Department of Defense is conducting a survey of military personnel from each of the four Services. The information obtained will be used to improve personnel policies.

Your participation in the survey is voluntary. While you are encouraged to answer each question as carefully as you can, you may skip a question if you do not wish to provide the information requested.

#### PROTECTION OF PRIVACY

Public Law 93-579, entitled the Privacy act of 1974, requires that all individuals be informed of the purposes and uses to be made of the information which is solicited. The following is furnished to explain the reason why the information is requested and the general uses to which that information may be put.

**AUTHORITY:** The Department of Defense is empowered to solicit the information requested in the DoD Personnel Survey under the authority of 10 United States Code 136.

**PURPOSE:** The information obtained in the survey is used to evaluate and improve military personnel policies.

**USES:** The information will be used for research and analysis purposes only. The Department of Defense Manpower Research and Data Analysis Center (MARDAC) has the primary research and analysis responsibility. Summarized data which do not contain individual identifiers may be provided to other components of the Department of Defense and to Defense Contractors for use in the analysis of data relating to specific personnel policies and issues.

**EFFECTS OF NON-DISCLOSURE:** Participation in the survey is voluntary. No penalty will be imposed for failure to respond to any particular questions.

#### HOW TO FILL OUT SURVEY

##### EXAMPLE

If your social security number is 123121234 you write the numbers in the boxes provided and fill out the bubbles as shown.

##### IF A MULTIPLE CHOICE QUESTION

##### EXAMPLE

Your pay grade is

E1 E2 E3 E4 E5 E6 E7



If your answer is E6 then just fill in proper bubble.

#### USE ONLY A NUMBER TWO PENCIL

1 2 3 1 2 1 2 3 4

0 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )  
1 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )  
2 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )  
3 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )  
4 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )  
5 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )

Examples  
of **PROPER** marks



Examples  
of **IMPROPER** marks



#### END OF INSTRUCTIONS & EXAMPLES — START SURVEY

What is your social security number?

--	--	--	--	--	--	--	--	--	--

0 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )  
1 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )  
2 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )  
3 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )  
4 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )  
5 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )  
6 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )  
7 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )  
8 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )  
9 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )

1. In what service are you now serving?

Navy  
Army  
Marine Corps  
Air Force

2. What is your present pay grade?

E1 E2 E3 E4 E5 E6 E7 E8 E9

3. Follow the instructions below (for your branch of service) to indicate your primary Military Occupational Specialty.

**ARMY:** Use the first 2 numbers and the letter of your MOS. For example, MOS 11B20 would be marked 11B. If you don't know, mark 000.

**NAVY:** Use the first 2 letters of your rating. For example, GMM3 would be marked GM. Do not make any marks for the third number/letter. If you don't know, mark 00.

**AIR FORCE:** Use the first 3 numbers of your AFSC — do not use letters. For example, AFSC A43130C would be written 431. If you don't know, mark 000.

**MARINE CORPS:** Use the first 3 numbers of your MOS. For example, MOS 0311 would be marked 031. If you don't know, mark 000.

Write the Number/Letter in each box

THEN, mark the matching circle below each box

FIRST	SECOND	THIRD
( )	( )	( )
0 ( ) ( ) ( )	0 ( ) ( ) ( )	0 ( ) ( ) ( )
1 ( ) ( ) ( )	1 ( ) ( ) ( )	1 ( ) ( ) ( )
2 ( ) ( ) ( )	2 ( ) ( ) ( )	2 ( ) ( ) ( )
3 ( ) ( ) ( )	3 ( ) ( ) ( )	3 ( ) ( ) ( )
4 ( ) ( ) ( )	4 ( ) ( ) ( )	4 ( ) ( ) ( )
5 ( ) ( ) ( )	5 ( ) ( ) ( )	5 ( ) ( ) ( )
6 ( ) ( ) ( )	6 ( ) ( ) ( )	6 ( ) ( ) ( )
7 ( ) ( ) ( )	7 ( ) ( ) ( )	7 ( ) ( ) ( )
8 ( ) ( ) ( )	8 ( ) ( ) ( )	8 ( ) ( ) ( )
9 ( ) ( ) ( )	9 ( ) ( ) ( )	9 ( ) ( ) ( )
X ( ) ( ) ( )	X ( ) ( ) ( )	X ( ) ( ) ( )
Y ( ) ( ) ( )	Y ( ) ( ) ( )	Y ( ) ( ) ( )
Z ( ) ( ) ( )	Z ( ) ( ) ( )	Z ( ) ( ) ( )

4. Are you assigned to a ship- or shore-based unit?

Ship-based  
Shore-based

CTB/MC GRAW-HILL MARDAC FORM A

5. Where is your present permanent duty station? (If on board ship, indicate the location of your home port.)

6. Where did you live during most of the time you were growing up?

	5.	6.
Middle Atlantic (New Jersey, New York, Pennsylvania)	<input type="radio"/>	<input type="radio"/>
New England (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont)	<input type="radio"/>	<input type="radio"/>
East North Central (Illinois, Indiana, Michigan, Ohio, Wisconsin)	<input type="radio"/>	<input type="radio"/>
West North Central (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota)	<input type="radio"/>	<input type="radio"/>
South Atlantic (Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia)	<input type="radio"/>	<input type="radio"/>
East South Central (Alabama, Kentucky, Mississippi, Tennessee)	<input type="radio"/>	<input type="radio"/>
West South Central (Arkansas, Louisiana, Oklahoma, Texas)	<input type="radio"/>	<input type="radio"/>
Mountain (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming)	<input type="radio"/>	<input type="radio"/>
Pacific (California, Oregon, Washington)	<input type="radio"/>	<input type="radio"/>
Alaska, Hawaii	<input type="radio"/>	<input type="radio"/>
Puerto Rico, other U.S. territories	<input type="radio"/>	<input type="radio"/>
Europe	<input type="radio"/>	<input type="radio"/>
Asia	<input type="radio"/>	<input type="radio"/>
Pacific	<input type="radio"/>	<input type="radio"/>
Other overseas location	<input type="radio"/>	<input type="radio"/>

7. What was your highest educational level when you first entered active duty, and what is it now?

	When First Entered	Now
No high school	<input type="radio"/>	<input type="radio"/>
Some high school	<input type="radio"/>	<input type="radio"/>
GED certificate or diploma	<input type="radio"/>	<input type="radio"/>
High school graduate	<input type="radio"/>	<input type="radio"/>
One or two years of college or vocational school (include Associate Degree)	<input type="radio"/>	<input type="radio"/>
More than two years of college	<input type="radio"/>	<input type="radio"/>
College degree (BA, BS or equivalent)	<input type="radio"/>	<input type="radio"/>
Graduate study but no graduate degree	<input type="radio"/>	<input type="radio"/>
Masters degree	<input type="radio"/>	<input type="radio"/>
Doctoral degree	<input type="radio"/>	<input type="radio"/>

8. What was the highest educational level each of the following persons completed? If you are not sure, please give your best guess.

	Father	Mother
Did not complete high school	<input type="radio"/>	<input type="radio"/>
Finished high school	<input type="radio"/>	<input type="radio"/>
Vocational training after high school	<input type="radio"/>	<input type="radio"/>
Some college	<input type="radio"/>	<input type="radio"/>
Finished college (four years) or more	<input type="radio"/>	<input type="radio"/>

9. How old were you on your last birthday?

0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

10. What is your marital status?

Married	Divorced or legally separated
Single, never married	Widowed

11. What is your sex?

Male	Female
------	--------

12. Which of the following do you consider yourself?

White/Caucasian	Asian American
Black/Negro	Latin American
Mexican American	Other
American Indian	

13. To the nearest year and month, how long have you been on active duty? (If you had a break in service, count current time and time in previous tours.)

Years	Months
0 0	0 0
1 1	1 1
2 2	2
3 3	3
4	4
5	5
6	6
7	7
8	8
9	9

14. How soon will you complete your current enlistment?

<input type="radio"/> Less than 3 months
<input type="radio"/> Three months but less than 6 months
<input type="radio"/> Six months but less than one year
<input type="radio"/> One year but less than 2 years
<input type="radio"/> Two years but less than 3 years
<input type="radio"/> Three years or more

15. In the past 52 weeks, how many weeks did you work more than five days?

Weeks
0
1
2
3
4
5
6
7
8
9

16. During the past 12 months, how many hours a week were you normally expected to be at your duty or work station in a standard work week? (Standard work week as specified by your unit's policies or directives.)

Hours per Week
0
1
2
3
4
5
6
7
8
9

17. During the past 12 months, how many hours a week did you spend on the average at your duty or work station? (Count overtime, if any.)

Hours per Week
0
1
2
3
4
5
6
7
8
9

18. During the past 12 months, how many hours of time off from duty did you receive in workday passes or compensatory time?

Hours
0
1
2
3
4
5
6
7
8
9

20. Overall, how much would you have to earn per month in a civilian job in order to have the same pay, allowances, and benefits you are getting in military service?

0
1
2
3
4
5
6
7
8
9

21. How would you compare the total of your military pay, allowance, and benefits compared to what you could earn in civilian life?

- ☐ Much more in the military  
☐ A little more in the military  
☐ About the same  
☐ A little more in civilian life  
☐ Much more in civilian life  
☐ I have no idea what I could earn in civilian life.

22. Are you satisfied with the promotion system in your Service?

- ☐ Very satisfied  
☐ Somewhat satisfied  
☐ Neither satisfied or dissatisfied  
☐ Somewhat dissatisfied  
☐ Very dissatisfied

23. During your military service, how many months have you been assigned to a combat or hostile fire zone?

0
1
2
3
4
5
6
7
8
9

19. Listed below are some statements about Service life. How well do you agree with each statement?

Statement	Amount of Agreement
I could make a lot more money in civilian life than in the service.	0 1 2 3 4 5
Being the job the military does is both necessary and important.	0 1 2 3 4 5
My fringe benefits in the Service are so much better than in civilian jobs that the Service is actually a better deal.	0 1 2 3 4 5
Service rules and regulations interfere too much with my right to live my life in my own way.	0 1 2 3 4 5
One benefit of the Service is that I can take the skills I learn and use them to get a good job in civilian life.	0 1 2 3 4 5
All too often, the Service has not kept its promises to me about training.	0 1 2 3 4 5
Job training in the Service is not nearly as good as you can get in civilian life.	0 1 2 3 4 5
There has been a reduction of military benefits over the past few years.	0 1 2 3 4 5
In the Service I cannot effect my own rate of promotion the way I could in civilian life.	0 1 2 3 4 5

24. How many permanent changes of station (PCS) have you made during the time you have been in military service?

0	1
---	---

(0) (1)  
(2) (2)  
(3) (3)  
(4) (4)  
(5) (5)  
(6) (6)  
(7) (7)  
(8) (8)  
(9) (9)

25. How many of these permanent changes of station do you consider to be undesirable?

0	1
---	---

(0) (1)  
(2) (2)  
(3) (3)  
(4) (4)  
(5) (5)  
(6) (6)  
(7) (7)  
(8) (8)  
(9) (9)

26. In the past 12 months, how many times did YOU go to a military medical facility or dental clinic during duty hours for outpatient treatment? (Do not count the times you went for required physical exams, shots or hospitalization).

0	1
---	---

(0) (1)  
(2) (2)  
(3) (3)  
(4) (4)  
(5) (5)  
(6) (6)  
(7) (7)  
(8) (8)  
(9) (9)

27. On the average, how many hours were you away from duty for each of these visits? (Do not count hospitalization time.)

- (0) Less than 1/2 hour  
(1) 1/2 to 1 hour  
(2) 1 to 1 1/2 hours  
(3) 1 1/2 to 2 hours  
(4) 2 to 2 1/2 hours  
(5) 2 1/2 to 3 hours  
(6) 3 to 4 hours  
(7) 4 to 8 hours

28. In the past 12 months, how much money did you spend on medical or dental care for yourself and dependents (If any) for which you did not get paid back?

Medical				Dental			
0	1	2	3	0	1	2	3

(0) (1) (2) (3) (4) (5) (6) (7) (8) (9)  
(0) (1) (2) (3) (4) (5) (6) (7) (8) (9)  
(0) (1) (2) (3) (4) (5) (6) (7) (8) (9)  
(0) (1) (2) (3) (4) (5) (6) (7) (8) (9)  
(0) (1) (2) (3) (4) (5) (6) (7) (8) (9)  
(0) (1) (2) (3) (4) (5) (6) (7) (8) (9)  
(0) (1) (2) (3) (4) (5) (6) (7) (8) (9)  
(0) (1) (2) (3) (4) (5) (6) (7) (8) (9)  
(0) (1) (2) (3) (4) (5) (6) (7) (8) (9)

29. In the past 12 months, how many days were you hospitalized?

0	1
---	---

(0) (1)  
(2) (2)  
(3) (3)  
(4) (4)  
(5) (5)  
(6) (6)  
(7) (7)  
(8) (8)  
(9) (9)

30. How much per month do you think you would have to pay for a health insurance policy that would provide the same medical care that is now available to you and your dependents, if any?

0	1
---	---

(0) (1)  
(2) (2)  
(3) (3)  
(4) (4)  
(5) (5)  
(6) (6)  
(7) (7)  
(8) (8)  
(9) (9)

31. How many dependents do you have? (Do not include yourself.)

IF YOU HAVE NO DEPENDENTS, SKIP TO QUESTION 40

32. How many dependents are living with you now?

33. How many of these dependents are your own children who are under 18 years old? (Count stepchildren or adopted children).

0	1	2
---	---	---

(0) (1) (2) (3) (4) (5) (6) (7) (8) (9)  
(0) (1) (2) (3) (4) (5) (6) (7) (8) (9)  
(0) (1) (2) (3) (4) (5) (6) (7) (8) (9)  
(0) (1) (2) (3) (4) (5) (6) (7) (8) (9)  
(0) (1) (2) (3) (4) (5) (6) (7) (8) (9)  
(0) (1) (2) (3) (4) (5) (6) (7) (8) (9)  
(0) (1) (2) (3) (4) (5) (6) (7) (8) (9)  
(0) (1) (2) (3) (4) (5) (6) (7) (8) (9)  
(0) (1) (2) (3) (4) (5) (6) (7) (8) (9)

34. Since you have been in the service and had dependents, about what percent of that time have you been separated from them due to the nature of your service assignments?

0	1
---	---

(0) (1)  
(2) (2)  
(3) (3)  
(4) (4)  
(5) (5)  
(6) (6)  
(7) (7)  
(8) (8)  
(9) (9)



35. In the past 12 months, how many visits have YOUR DEPENDENTS made to a military medical or dental facility for examination or treatment?

Medical	Dental
0 (0)	0 (0)
1 (1)	1 (1)
2 (2)	2 (2)
3 (3)	3 (3)
4 (4)	4 (4)
5 (5)	5 (5)
6 (6)	6 (6)
7 (7)	7 (7)
8 (8)	8 (8)
9 (9)	9 (9)

36. In the past 12 months, how many visits have YOUR DEPENDENTS made to a civilian doctor or dentist?

Doctor	Dentist
0 (0)	0 (0)
1 (1)	1 (1)
2 (2)	2 (2)
3 (3)	3 (3)
4 (4)	4 (4)
5 (5)	5 (5)
6 (6)	6 (6)
7 (7)	7 (7)
8 (8)	8 (8)
9 (9)	9 (9)

37. In the past 12 months, how many days were YOUR DEPENDENTS hospitalized in a military hospital?

37.	38.
0 (0)	0 (0)
1 (1)	1 (1)
2 (2)	2 (2)
3 (3)	3 (3)
4 (4)	4 (4)
5 (5)	5 (5)
6 (6)	6 (6)
7 (7)	7 (7)
8 (8)	8 (8)
9 (9)	9 (9)

38. In the past 12 months, how many days were YOUR DEPENDENTS hospitalized in a civilian hospital?

37.	38.
0 (0)	0 (0)
1 (1)	1 (1)
2 (2)	2 (2)
3 (3)	3 (3)
4 (4)	4 (4)
5 (5)	5 (5)
6 (6)	6 (6)
7 (7)	7 (7)
8 (8)	8 (8)
9 (9)	9 (9)

39. Suppose that the military services offered a new dependent medical plan under which dependents could only use CHAMPUS but not military medical facilities. The plan would pay you \$30 per month if you have one dependent, or \$60 per month if you have two or more dependents. This amount could be taken in cash or used to buy supplemental insurance to help pay costs not covered by CHAMPUS. Would you prefer to have this plan or to keep things the way they are now?

- ☐ Prefer the new plan, and I would take the cash.
- ☐ Prefer the new plan, and I would buy the insurance.
- ☐ Prefer to keep things the way they are now.

40. If you left the Service right now, how much would you expect to earn per month in wages or salary if you took a full-time job? (Do not include fringe benefits.)

0 (0)	0 (0)	0 (0)	0 (0)
1 (1)	1 (1)	1 (1)	1 (1)
2 (2)	2 (2)	2 (2)	2 (2)
3 (3)	3 (3)	3 (3)	3 (3)
4 (4)	4 (4)	4 (4)	4 (4)
5 (5)	5 (5)	5 (5)	5 (5)
6 (6)	6 (6)	6 (6)	6 (6)
7 (7)	7 (7)	7 (7)	7 (7)
8 (8)	8 (8)	8 (8)	8 (8)
9 (9)	9 (9)	9 (9)	9 (9)

41. What kind of work would you do? Be as specific as you can. (Example: TV repairman, carpenter, high school teacher, etc.) Write your answer in the space provided.

42. And what about three years from now? About how much would you be earning per month if you stayed in civilian life? (Assume that civilian pay goes up about as it has recently. Do not include fringe benefits.)

0 (0)	0 (0)	0 (0)	0 (0)
1 (1)	1 (1)	1 (1)	1 (1)
2 (2)	2 (2)	2 (2)	2 (2)
3 (3)	3 (3)	3 (3)	3 (3)
4 (4)	4 (4)	4 (4)	4 (4)
5 (5)	5 (5)	5 (5)	5 (5)
6 (6)	6 (6)	6 (6)	6 (6)
7 (7)	7 (7)	7 (7)	7 (7)
8 (8)	8 (8)	8 (8)	8 (8)
9 (9)	9 (9)	9 (9)	9 (9)

43. Now suppose that you stayed in the Service for at least 3 more years. What pay grade would you expect to have then?

<input type="radio"/> E1	<input type="radio"/> E4	<input type="radio"/> E7
<input type="radio"/> E2	<input type="radio"/> E5	<input type="radio"/> E8
<input type="radio"/> E3	<input type="radio"/> E6	<input type="radio"/> E9

44. If you could work in the career field of your choice, which of the following career paths would you prefer? (The pay for both would be the same.)

<input type="radio"/> Be a supervisor
<input type="radio"/> Work in the career field, but not supervising others

45. Which of the following best describes your contact with the civilian job market during the last 12 months?

<input type="radio"/> I have accepted a civilian job which I will take when I leave the service.
<input type="radio"/> I have received civilian job offers.
<input type="radio"/> I have interviewed for a civilian job.
<input type="radio"/> I have seriously looked at the civilian job market.
<input type="radio"/> I have looked at help wanted ads, but not seriously.
<input type="radio"/> Friends or relatives have told me of jobs that were open.
<input type="radio"/> I have had no contact with the civilian job market.

46. If you were to leave the service and take a civilian job, how do you think that job would compare with your present military job in regard to the following working conditions?

Civilian much worse  
Civilian slightly worse  
Civilian no different  
Civilian slightly better  
Civilian much better

<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Supervisors
<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Having a say in what happens to you
<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Retirement benefits
<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Responsibility on the job
<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Medical benefits
<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Interesting work
<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Pay for same kind of work
<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Chances for promotion
<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Training opportunity
<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Chances to use my skills
<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	The people you work with
<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Hours of work

47. During the past 12 months, what is the number of weeks you worked for pay at a second job during your off-duty hours; and what was the average number of hours usually worked per week?

Weeks	Hours
<input type="text"/>	<input type="text"/>
(1) (1)	(1) (1)
(2) (2)	(2) (2)
(3) (3)	(3) (3)
(4) (4)	(4) (4)
(5) (5)	(5) (5)
(6) (6)	(6) (6)
(7) (7)	(7) (7)
(8) (8)	(8) (8)
(9) (9)	(9) (9)

48. During the past 12 months how much money did you earn (before taxes and other deductions) for working during your off-duty time?

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
(1) (1)	(1) (1)	(1) (1)	(1) (1)	(1) (1)
(2) (2)	(2) (2)	(2) (2)	(2) (2)	(2) (2)
(3) (3)	(3) (3)	(3) (3)	(3) (3)	(3) (3)
(4) (4)	(4) (4)	(4) (4)	(4) (4)	(4) (4)
(5) (5)	(5) (5)	(5) (5)	(5) (5)	(5) (5)
(6) (6)	(6) (6)	(6) (6)	(6) (6)	(6) (6)
(7) (7)	(7) (7)	(7) (7)	(7) (7)	(7) (7)
(8) (8)	(8) (8)	(8) (8)	(8) (8)	(8) (8)
(9) (9)	(9) (9)	(9) (9)	(9) (9)	(9) (9)

49. During the past 12 months, approximately what was the total amount (before taxes and other deductions) that your spouse earned?

☐ I am not married.  
☐ My spouse did not work.  
My spouse worked and earned

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
(1) (1)	(1) (1)	(1) (1)	(1) (1)	(1) (1)
(2) (2)	(2) (2)	(2) (2)	(2) (2)	(2) (2)
(3) (3)	(3) (3)	(3) (3)	(3) (3)	(3) (3)
(4) (4)	(4) (4)	(4) (4)	(4) (4)	(4) (4)
(5) (5)	(5) (5)	(5) (5)	(5) (5)	(5) (5)
(6) (6)	(6) (6)	(6) (6)	(6) (6)	(6) (6)
(7) (7)	(7) (7)	(7) (7)	(7) (7)	(7) (7)
(8) (8)	(8) (8)	(8) (8)	(8) (8)	(8) (8)
(9) (9)	(9) (9)	(9) (9)	(9) (9)	(9) (9)

50. In which enlistment period are you currently serving? (Do not count extensions.)

<input type="text"/>
1
2
3
4
5
6
7
8
9

51. Do you intend to reenlist when your present term of Service is completed?

☐ Yes  
☐ Undecided, but probably yes  
☐ Undecided, but probably no  
☐ No  
☐ Does not apply — will retire when my current term of Service is completed or some other reason

52. How concerned are you that you may not be permitted to reenlist when your present tour is completed?

☐ Does not apply — I do not intend to reenlist.  
☐ Does not apply — I've already been informed about my eligibility.  
☐ Very much  
☐ Fairly much  
☐ Somewhat  
☐ Very little  
☐ Not at all

53. How much influence does the present retirement system have on your decision to make the military a career?

☐ It is a strong influence to stay.  
☐ It is some influence to stay.  
☐ It has no effect.  
☐ It is some influence to leave.  
☐ It is a strong influence to leave.

54. What effect does the possibility of obtaining G.I. Bill benefits after leaving Service have on your career plans?

☐ None  
☐ Influences me to get out as soon as possible  
☐ Influences me to remain until retirement

55. When you finally leave the military, how many total years of service do you expect to have?

<input type="text"/>	<input type="text"/>
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

56. When you finally leave the military, what pay grade do you think you will have?

E1 E2 E3 E4 E5 E6 E7 E8 E9

The answer choices and response positions for Questions 57 through 61 are located following Question 61.

57. On the scale following Question 61, how likely are you to reenlist at the end of your current term of service?

58. Suppose that people in your career field are given a new bonus of \$3000 to reenlist for four years. (This would be in addition to any other bonus which you now get.) The bonus would be paid in annual installments of \$750 each. How likely are you to reenlist for four years, with this bonus?

59. Suppose that instead the new bonus is paid immediately as a lump sum when you reenlist, but is only \$2500. How likely are you to reenlist for four years with this bonus?

60. Suppose instead that no new bonuses are given but base pay is increased by \$50 a month over and above normal pay adjustments. How likely are you to reenlist now?

61. Suppose that there is no new bonus and no special pay increase, but you get a new uniform cleaning allowance of \$240 per year. How likely are you to reenlist under this plan?

	57.	58.	59.	60.	61.
No chance, very slight possibility (1 in 10 or less)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Slight possibility (2 in 10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Some possibility (3 in 10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fair possibility (4 in 10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fairly good possibility (5 in 10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Good possibility (6 in 10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Probable (7 in 10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Very probable (8 in 10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Certain, almost sure (9 in 10 or better)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

62. What is your annual Regular Military Compensation (RMC)? Base your answer on the total value of your basic pay, the cash value of your quarters and subsistence allowance (whether received in cash or in kind) and the Federal tax advantage of the two allowances.

0	1	2	3	4
5	6	7	8	9

63. What do you estimate to be the annual value of your total military pay including the major military fringe benefits? Include basic pay, special pays, that portion of any reenlistment bonus received in the last 12 months, cash value of your quarters and subsistence allowances (even though you may be receiving quarters and subsistence in kind), federal tax advantage on the two allowances, and your estimate of the cash value of the following major fringe benefits: military retirement benefit; social security benefits; medical and dental care for you and your family; medical absence for yourself; life insurance benefits, such as SGLI and survivors benefits; military leave; paid holidays; commissary and exchange benefits.

0	1	2	3	4
5	6	7	8	9

64. What do you estimate to be the annual value of your total military compensation? Include all items listed in the above question plus any other military benefits you receive. Consider such additional items such as educational benefits, recreational benefits, travel benefits, etc.

0	1	2	3	4
5	6	7	8	9

65. Now considering your total military compensation (pay and benefits) described above, how do you think it compares with total compensation (pay and benefits) in civilian work you would do if you left the service?

- ☐ Much more in the military  
☐ A little more in the military  
☐ About the same  
☐ A little more in civilian life  
☐ Much more in civilian life  
☐ I have no idea what I could earn in civilian life

66. Are you currently receiving a cash Basic Allowance for Quarters (BAQ)?

- ☐ yes  
☐ no  
☐ don't know

67. Are you currently receiving a cash Basic Allowance for Subsistence (BAS)?

- ☐ yes  
☐ no  
☐ don't know

68. Did you receive a reenlistment bonus in the past 12 months? Consider any Regular Reenlistment Bonus (RB), Selective Reenlistment Bonus (SRB), Variable Reenlistment Bonus (VRB) installment.

yes  
no  
don't know

Amount was

--	--	--	--	--

0 (0) 0 (0) 0  
1 (1) 1 (1) 1  
2 (2) 2 (2) 2  
3 (3) 3 (3) 3  
4 (4) 4 (4) 4  
5 (5) 5 (5) 5  
6 (6) 6 (6) 6  
7 (7) 7 (7) 7  
8 (8) 8 (8) 8  
9 (9) 9 (9) 9

69. Do you currently receive any special monthly pay? Jump pay, sea pay, submarine pay, flight pay, certain places pay (foreign duty pay), pro pay, etc.?

yes  
no

Amount:

--	--	--	--	--

(0) (0) (0) (0) (0)  
1 (1) (1) (1) (1) (1)  
2 (2) (2) (2) (2) (2)  
3 (3) (3) (3) (3) (3)  
4 (4) (4) (4) (4) (4)  
5 (5) (5) (5) (5) (5)  
6 (6) (6) (6) (6) (6)  
7 (7) (7) (7) (7) (7)  
8 (8) (8) (8) (8) (8)  
9 (9) (9) (9) (9) (9)

70. Suppose the Service offered a new, optional retirement plan. Under this plan, you could increase your base pay from now on by 10 percent if you agreed to cut your retirement pay by 20 percent. Or, you could increase your base pay by 5 percent if you agreed to cut your retirement pay by 10 percent. If this plan were adopted, which of the following options would you choose?

Increase base pay by 10 percent; cut retirement pay by 20 percent  
Increase base pay by 5 percent; cut retirement pay by 10 percent  
Keep base pay and retirement pay the same as they are now

71. Suppose that the retirement system was changed so that full retirement pay was paid only after you have 30 years of service. If you retire between 20 and 30 years of service, you would receive two-thirds of the current retirement pay until you are 50 years old. After age 50, you would get the full retirement pay. Under this plan, how many years do you think your total Service career would be?

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(0) (0)  
(1) (1)  
(2) (2)  
(3) (3)  
(4) (4)  
(5)  
(6)  
(7)  
(8)  
(9)

72. Suppose that a special retirement plan is set up for people who have at least 10 years of service but leave before they have 20 years. The special plan would pay 2.5 percent of base pay per year of service, but would start only when you reach age 60. The regular retired pay would still be paid if you stayed for 20 years or more. Under this new plan, when you finally leave the military, how many total years of service do you expect you would have?

--	--

0 0  
1 1  
2 2  
3 3  
4  
5  
6  
7  
8  
9

If this is your first term of enlistment, complete the following questions. Otherwise you are through with this questionnaire.

73. Were you working when you decided to enter military service?

Yes, full-time  
Yes, part-time  
No, but I was looking for work  
No, and I was not looking for work

74. Were you going to school when you decided to enter military service?

Yes, full-time  
Yes, part-time  
No

75. When you were working what kind of work did you do? (For example, auto mechanic, stock-boy, welder, etc.) Write your answer in the space provided.

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76. If there had been no draft and you had no military obligation, do you think you would have enlisted?

Does not apply, I am a female  
There was no draft when I enlisted  
Definitely Yes  
Probably Yes  
Probably No  
Definitely No  
I do not know

SPECIAL CODES  
FOR CTB USE ONLY

0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9

## BIBLIOGRAPHY

- Brunner, G. L., *The Importance of Volunteer Status: An Analysis and Reliability Test of Survey Data*, The Rand Corporation, R-717-PR, 1971.
- Chow, Winston K., "A Look at Various Estimators in Logistic Models in the Presence of Missing Values," *Proceedings of the Business and Economics Statistics Section, American Statistical Association*, 1979, pp. 417-420. Also published as N-1324-HEW, The Rand Corporation, 1979.
- Efron, B., "The Efficiency of Logistic Regression Compared to Normal Discriminant Analysis," *Journal of the American Statistical Association*, Vol. 70, 1975, pp. 892-898.
- Enns, John H., *Reenlistment Bonuses and First-Term Retention*, The Rand Corporation, R-1935-ARPA, 1977.
- Goodstadt, Barry E., and Albert S. Glickman, *The Current Status of Enlisted Attrition in the U.S. Navy and in the U.S. Marine Corps and the Search for Remedies*, American Institutes for Research, Washington, D.C., 1975.
- Haber, Sheldon E., and Charles I. Stewart, Jr., *The Responsiveness of Reenlistment to Changes in Navy Compensation*, George Washington University, Report TR-1254, 1975.
- Haggstrom, G. W., *Discriminant Analysis and Logistic Regression*, unpublished notes, 1974.
- Halperin, M., W. C. Blackwelder, and J. I. Verter, "Estimation of the Multivariate Logistic Risk Function: A Comparison of the Discriminant Function and Maximum Likelihood Approaches," *Journal of Chronic Diseases*, Vol. 24, 1971, pp. 125-158.
- Kleinman, Samuel D., and William F. Shughart II, *The Effects of Reenlistment Bonuses*, Center for Naval Analyses, Report CRC 269, Arlington, Va., 1974.
- Lockman, Robert F., Peter H. Stoloff, and A. Slagle Allbritton, *Motivational Factors in Accession and Retention Behavior*, Center for Naval Analyses, Report CRC-201, Arlington, Va., 1972.
- McCall, John J., and Neil Wallace, "A Supply Function of First-Term Re-Enlistees to the Air Force," *Journal of Human Resources*, Vol. 4, 1969, pp. 293-310.
- Nelson, Gary R., "Economic Analysis of First-Term Reenlistment in the Army," in T. S. Gates et al., *Studies Prepared for the President's Commission on an All-Volunteer Armed Force*, Vol. 1, Government Printing Office, Washington, D.C., 1970.
- Nelson, Gary R., and Robert C. Wilburn, *Career Choice and the Supply of Military Manpower*, Institute for Defense Analyses, Arlington, Va., 1972.
- Perry, Wayne D., *First-Term Reenlistment Intentions of Avionics Technicians: A Quantitative Analysis*, The Rand Corporation, R-2152-ARPA, 1977.
- Press, S. J., and S. Wilson, "Choosing Between Logistic Regression and Discriminant Analysis," *Journal of the American Statistical Association*, Vol. 73, 1978, pp. 699-705.
- Quigley, John M., and Robert C. Wilburn, *An Economic Analysis of First Term Reenlistment in the Air Force*, Air Force Personnel Analysis Project Report

- No. 69-017, Personnel Research and Analysis Division, Washington, D.C., 1969.
- Schuman, Howard, and Michael P. Johnson, "Attitudes and Behavior," in Alex Inkeles, James Coleman, and Neil Smelser (eds.), *Annual Review of Sociology*, Annual Reviews, Inc., Palo Alto, California, 1976, pp. 161-208.
- Smith, Roberta J., *A Description of the Enlisted Service Rotation System*, The Rand Corporation, N-1004-MRAL, 1979.
- Stoloff, Peter H., Robert F. Lockman, A. Slagle Allbritton, and Harold H. McKinley, Jr., *An Analysis of First-Term Reenlistment Intentions*, Report CRC-232, Center for Naval Analyses, Arlington, Va., 1972.

